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THE RELIABILITY OF SOCIOMETRIC MEASURES

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The University of Texas[1]

Daily social relations are based on the assessments people make of one another as a product of interaction. Such assessments are direct judgments made without the benefit of formalized scales or any of the standardized techniques of quantification that have become routine in psychological measurement. Many times they are carried through at an implicit and intuitive level, and the judges themselves have difficulty in identifying the clues on which their responses are based. The processes that underlie such judgments may come to recognition or overt expression only under particular conditions, and rarely are they recorded in such a way as to make them accessible for systematic examination. Since these reactions are one of the essential ingredients of interaction, an understanding of the judgmental process on which they are based is important to the developing science of human relations.

The closest formal means of quantifying the assessments people make of one another are the various direct choice techniques. These procedures require members of a specified group to give overt expressions concerning their reactions to one another in terms of an explicit criterion which is standard for the group as a whole. The explicit expression of choice seems to be based on psychological processes similar to those involved in the intuitive or implicit social judgment. It brings them to a level of formal expression, however, thereby permitting the investigator to study certain aspects of this choice process.

In the systematic analysis of direct social judgment, the sociometric techniques of Moreno (34) stand out as the original method of investigation. These methods and their modifications constitute the closest approximation to the measurement of the judgments people make concerning one another in real life situations. The recording of these judgments provides data permitting systematic study of the cognitive and affective reactions that obtain in human relations.

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A variety of problems requiring detailed investigation arises from the use of any of the direct assessment techniques. These range from the evaluation of the reliability of choice data, through the use of such data to describe group structure, to the construction of a verifiable theory of social relations. The problem dealt with in this paper is limited to an evaluation of the consistency of choice data and indices derived from them. Do such data satisfy the consistency requirements that they must meet in order to be useful for the systematic measurement and prediction of human relations?

Description of Direct Choice Data

Because sociometric data are sufficiently different from the types of scores with which psychologists are accustomed to deal, it is desirable to examine their characteristics in some detail. A description of a sociometric-type choosing situation is presented below.

Description of a Choosing Situation

A typical situation in which sociometric procedures have commonly been used is the classroom. The teacher might introduce the procedure by announcing that the seating was to be rearranged in terms of the preferences that children have for sitting near one another. He might then ask the children to list the classmates with whom they would like to sit by placing the one with whom they would most prefer to sit first in the list, the next most preferred second in the list and so on, including as many names as they wish. Using their responses he would determine which seating arrangement would best satisfy the desires of all the children. Then the seating plan could be changed accordingly. This procedure represents the basic model, but many variations such as the use of a fixed number of choices, the use of a general question about reactions to others, the use of a preference ranking and so on have been introduced.

Consideration of the Choice Data

For a particular respondent the preferences expressed in a choice situation like that previously presented have the effect of separating the total group into two parts, those whom he chooses and those whom he fails to choose. Under certain conditions the respondent is asked not only to name his choices but also to identify those whom he rejects—in the situation just described he would be asked to name those near whom he would prefer not to sit. If rejections are requested and if the group is sufficiently large, so that some members remain unidentified under the list of those who were

chosen and those who were rejected, each member's list provides a rough separation of the group into three parts including one made up of those whom he chooses, another of those whom he rejects, and an intermediate part composed of those whom he neither chooses nor rejects. Depending on the form of the assessment questionnaire the group as a whole is ordered so that two or three groupings of other members are made by each individual. It should be noted that the division point by which the subject determines the members he will include in each of the several categories is often an individual decision. The investigator may or may not place restrictions as to how many a respondent should place in this or that category.

PROBLEMS IN INTERPRETING THE MEANING OF RESPONSES

The problems that arise in interpreting the meaning of choice (or rejection) data are numerous with the particular issue depending on the uses to be made of them. The data can be employed for planning or rearranging a social situation or for installing some other administrative change. Criteria for choice that have been used in this way are "With whom would you like to sit?," "Whom would you like for a roommate?," and "With whom would you like to work?" Few technical problems appear beyond eliciting the group's cooperation in supplying the data when the uses are limited to a direct practical application.

Sociometric responses also may serve as one basis for the systematic study of social-psychological processes. This is the case where the choices given are used to derive an index of cohesiveness, to grade individuals in terms of their social acceptability, or to study the leadership phenomena. If they are used for systematic purposes of these kinds problems of a technical sort often arise. One of these problems is concerned with the consistency of sociometric responses.

The problem of consistency has specific application in sociometric measurement. When individuals in a group are asked to evaluate one another in terms of some criterion of choice the responses serve to differentiate the members from one another. While the choices may identify only those members who possess a significant amount of the property defined by the criterion, it is nonetheless a comparative judgment. Those not identified are presumed to possess the characteristics to a lesser degree than those who are identified. One way of assessing consistency would be to determine the extent to which choices from a second administration of the technique characterize the subjects in the same way as choices expressed on the first administration. If they do agree this would mean that two administrations of the same scale

produce essentially the same results. If the responses from the second administration fail to correspond with those from the first this would suggest that the use of sociometric procedures in situations which demand a consistency in the data over different periods of time would be unwarranted.

OPPOSING VIEWS WITH RESPECT TO THIS QUESTION

There are opposing views as to whether or not sociometric data should possess the kind of consistency described above. It is maintained that behavior is flexible and adaptive and undergoing such a continuous process of change that reliability coefficients expressing a relationship between two occasions should not be expected to be high. Then a high coefficient would suggest that the sociometric test is not sufficiently sensitive as a measure of changing interpersonal relations to warrant its use for studying the dynamics of social interaction. An alternative view maintains that the behavior of persons is sufficiently invariant from one occasion to the next so that it should be possible to demonstrate consistency of this type. From the standpoint of the latter consideration a high coefficient would constitute the minimum indication of stability necessary for coordinated interpersonal relationships. The studies to be presented later will permit a more detailed examination of these alternative views.

FRAMES OF REFERENCE FOR ANALYZING SOCIOMETRIC RESPONSES

The consistency of sociometric responses can be evaluated from either of two frames of reference. The first involves determining the consistency of choices given, while the second is concerned with evaluating the stability of choices received.

Choices given. In administering a sociometric test each person is asked to nominate from among the remaining group those having the characteristics defined by the criterion used as the basis for response. In order to collect data that are useful for the analysis of consistency subjects are asked to make nominations in the same terms on a second occasion. With data from two different test administrations available the consistency from the first to the second occasions of the choices given can be determined on a person-by-person basis. If a person nominated the same people on the second occasion as he had on the first and this was also true for all the other group members there would be no change in responses on the two occasions, and it could be concluded that for those conditions the choice process was completely stable. With no stability in the choice process the nominations made on the first occasion would bear no consistent relationship to those made on the second. This procedure of determining the per cent change in the responses gives

from one occasion to another has been a method for assessing the reliability of sociometric data.

Choices received. The same data can also be examined from the point of view of the distribution of responses received. The reliability of the distribution of choices received is concerned with the degree of consistency in the positions in the distribution of the various individuals on two test administrations, so that the reliability can be very high in terms of choices received while the sources of the choices might change between any two occasions. In this analysis it is unimportant whether or not the person receiving an unchanged number of choices receives them from the same people. What is necessary is obtaining high reliability is that the number of choices received remains essentially the same. The consistency of sociometric data will be evaluated in terms of both choices given and choices received.

Independence of administrations. Assessing the reliability of a measuring instrument requires that the two occasions of its administration be independent of one another. This requirement is based on the following considerations. If the act of assessing performance on one occasion can influence the act of assessing performance on the second then the consistency between the two assessments might be attributed in part to the relationship between the two acts rather than to stability in the performance assessed. If the situation on the second administration is such that the subject can recall the responses given on the first then it is possible for the consistency in response between the two administrations to be high due to the recall and reproduction on the second occasion of the same response as had been given on the first. While this difficulty is a consideration in the method of test-retest reliability analysis the routine conditions of social interaction make it particularly difficult to control in the evaluation of the reliability of sociometric data. In the typical sociometric-type measuring situation the same subjects are present on both occasions, but in this situation the possibility of spuriously high coefficients stemming from recall or other factors is increased.

Time and interaction. In the typical formulation of the reliability issue the critical test has been concerned with determining the degree of agreement between choice data collected on two occasions separated by varying time intervals. The time interval separating two test administrations has been treated as the dimension in terms of which changes in choice data would be expected if such differences were found. In studying consistency in this way, the assumption is made that time is a dimension through which changes in sociometric data can be assessed rather than that time *per*

se, is the causative factor responsible for any observed changes. Although differences in time are presumed to be associated with differences in the volume of interactions occurring among group members, the important factor is interaction. In the absence of more valid measures of differences in the amount of interaction, time differences between testing occasions have been used as one basis for assessing the extent to which changes in choice data are likely to be associated with different amounts of interaction. Precise determination would require a more adequate measure of interaction than the dimension of time provides, but the use of time differences in this way allows an approximate evaluation of the reliability of choice data.

Action consequences. In order for conventional conceptions of consistency to hold it is necessary that no significant changes in the situation occur between the first and second test administrations. If a significant change occurs any lack of correlation between the two sets of data could reasonably be attributed to situational variation rather than to response instability.

This is an important consideration in view of Moreno's stipulation that one of the necessary conditions for collecting valid data is that the participants recognize and accept the fact that changes will be introduced into the social situation as a function of the choices that are expressed (35). If this is done then the conditions for a later administration are different to the extent that changes have been introduced. In terms of the previous example, the children would be located close to their preferred seatmates and separated from those they do not prefer as contrasted with the situation that prevailed before the introduction of the sociometrically based changes. If the investigator follows the premise that changes in the situation should be made in order to secure valid data, he has introduced factors that may have a disturbing effect on measured reliability.

Effect of technique of measurement on reliability. A number of different methods of collecting choice data have been employed. Some of them are limited choice (choose 2, choose 3, etc.), unlimited choice, rank order (rank 2, rank 3, to rank the entire group), paired comparisons, and ratings. The method used in the collection of data is a factor to be considered in evaluating the reliability of choice data.

Methods used in computing reliability. A number of studies use the conventional statistical procedures of obtaining the correlation between responses on the first occasion and the responses on the second occasion. Product-moment and rank-difference correlations are the methods which have been employed most frequently to compute reliability coefficients.

Since the distribution of choices is highly skewed it is doubtful that the conditions for applying these methods are sufficiently satisfied in sociometric-type data. As most of the studies have used correlational analysis as the basis for establishing consistency, they will be used in the discussion to follow as one basis for estimating the consistency of sociometric data.

Katz and Powell (28) have devised a technique for computing an index of the extent of agreement between two sets of sociometric choices that have been recorded in matrix form. This index should be a more appropriate statistical technique for estimating reliability than those mentioned above since it is an expression of the extent of agreement of the entries in the two matrices. No assumptions concerning the form of the distributions are involved, but it does assume independence of the two sets of observations (see independence of administrations above) and applies the appropriate probability distributions for testing the significance of the relationship.

The Data

The problem of the consistency of sociometric data can be examined by evaluating and contrasting a number of published studies that bear on this topic.

The literature has been difficult to assess for a variety of reasons. Since very little systematic effort has been made to cross-reference sociometric articles appearing in the journals of a half-dozen disciplines it has proved impossible to insure the inclusion of all studies relevant to this particular problem in the present report. A second difficulty is due to the fact that many of the studies report data that have been gathered in connection with some other purpose than the one for which the investigation was undertaken and reported. The consequence is that information significant for interpretation of the reliability issue has often been omitted from the final report. Still other difficulties stem from the inferior quality of theoretical formulation, inadequate research design, and incorrect statistical treatment that characterize a number of studies. Despite these shortcomings, it seems possible to interpret the relevant studies in a meaningful way and to formulate significant issues that can serve to orient future research.

Consistency of Choices Given

The question of the consistency of choices *given* is concerned with determining the extent to which an individual's choice pattern remains unchanged after an additional period of interaction. A few investigators have supplied data which permit analysis of this problem. These are presented in Table 1.

TABLE 1

CONSISTENCY OF CHOICES GIVEN

Investigator	Criteria	Technique of Choosing	Subjects	Time Interval	Extent of Acquaintance at First Test	Per Cent of Change
Criswell (13)	Seating	Two limit choice	238 children (1st-6th grades)	6 weeks	Unstated	38% No change 42% 1 change 20% 2 changes 69% No change in first choice 49% No change in second choice
Barker (3)	Seatmate	Three limit choice	12 college students	3 months 36 meetings	Strangers	55% No change
Northway (35)	Companions	Three limit choice	36 nursery children	4 months	Unstated	78% No change 83% No change in first choice 78% No change in second choice 74% No change in third choice
Horrocks (25)	Best friends	Three limit choice	905 students (6th-12th grades,10-17 years)	2 weeks	Unstated	% of No change Age Boys Girls 10 50% 70% 11 48% 55% 12 63% 63% 13 60% 55% 14 55% 63% 15 60% 70% 16 65% 60% 17 55% 80%

(TABLE 1 *continued*)

Investigator	Criteria	Technique of Choosing	Subjects	Time Interval	Extent of Acquaintance at First Test	Per Cent of Change
Austin & Thompson (1)	Best friends	Three limit choice	404 children (6th grade in 7 schools)	2 weeks	Unstated	40% No change 38% 1 change 16% 2 changes 5% 3 changes
Danielson (15)	Friends, enemies	Three limit choice	69 adult male Jibero Indians	2 weeks	Unstated	94% No change
Scandrette (39)	Best friends	Three limit choice	78 7th grade students	4½ months	One semester	27.0% No change 32.0% 1 change 34.6% 2 changes 6.4% 3 changes
Singer (41)	Best friends and variations (8 times)	Three limit choice	28 students (7th & 8th grades)	1 ½ years	Group from 3 schools, previous grade	72% No changes in first choice

The usual testing procedure has involved asking subjects from the same group to make choices on two occasions. The responses are then examined to determine how many of the choices on the second administration are changed from those that were given on the first. If all choices on the second occasion were identical with those given on the first this would be described as 100 per cent *No Change*. If one-half the responses on the second occasion were different from those of the first this would be expressed as 50 per cent *No Change*, and if two-thirds of the choices were different this would yield approximately 33 per cent *No Change*. If none of the responses on the second occasion agreed with those given on the first this would represent 100 per cent *Change*, meaning that subjects consistently chose different people on the second occasion.

The summaries in the table have been organized to show several features of each study. These include the investigator, the criterion of choice, the technique of choosing, a description of the subjects who were involved in the study, the time interval between test and retest, the extent of acquaintance of group members at the time of first testing, and the per cent change in the choices over the time interval involved. The information available for each of the categories was taken from the original reports. The studies that have been grouped together are alike in that they are all based on a limited number of choices, 7 of the 8 requiring the respondents to give three choices. The subjects range from nursery school children to college students, and the time intervals between the tests extend from two weeks to one and one-half years.

The investigations reported in Table 1 are consistent in showing that a stable relationship exists between two test occasions when the basis for analysis is per cent of *No Change*. This conclusion applies irrespective of the sociometric criterion employed, the age and sex of subjects, the number of group members, the time interval between test administrations, and differences in degree of acquaintance at the time of first testing.

While there is a definite consistency between the two test occasions with choices given on one occasion being repeated on a second occasion, it is also apparent that the consistency is not perfect with different amounts of change being reported in each of the several studies. The specific values range from 27 per cent of *No Change* in the Scandrette (39) investigation to 77 per cent *No Change* in the study by Northway (35).

In view of the difficulties in interpreting raw per cents as presented in Table 1, it is desirable to determine statistical significance by contrasting the observed results with chance expectancy. The index of conformity

developed by Katz and Powell (28) is appropriate for this purpose. It was applied to the data from Criswell (13), Austin and Thompson (1), and Scandrette (39) studies for which there was fairly complete information on the changes between administrations. Since the size of the school classes was not reported an average size of thirty was adopted as a reasonable estimate for this purpose. The index of conformity for choices given on the two occasions in the Scandrette study yielded a coefficient of .51, and for the Criswell study a coefficient of .55 was obtained. These values are significant beyond the one per cent level. The index computed for the data in the Austin and Thompson study is .68, which is also significant beyond the one per cent level.

Additional assumptions concerning the data must be made in order to permit a statistical assessment of the significance of other studies in Table 1. The lowest percentage of *No Change* reported for these investigations is found in the Horrocks study (25). In evaluating these data it was assumed that all the remaining choices in the group of 30 were disagreements, an assumption which would produce the most conservative estimate of the degree of relationship. Based on these assumptions the computed index of conformity is .42, a value that is significant beyond the one per cent level. Similar assumptions were made for Barker's study (3) of 12 college students and a coefficient was obtained of .36. This value is also significant beyond the one per cent level.

The several statistical evaluations shown in Table 2 yield reasonably high coefficients and are significant for each of the studies involved. The relationship between the choices made on two test occasions is greater than chance factors could be expected to produce.

The significance of the reliability might also be interpreted as due to spurious factors such as the dependence between occasions and observers. Because of the inadequacy of the design of investigations from this standpoint there is no way to determine which of these two alternatives constitutes the more correct interpretation of these data.

THE CONSISTENCY OF CHOICE STATUS ON A TEST-RETEST BASIS

The question of consistency of choice status is concerned with evaluating the extent to which an individual's rank remains at the same position in the choice status continuum from one testing occasion to another. Choice status is defined as the position of an individual within a group. The index is derived from choices, ratings, or rankings received from other members on the basis of a specific criterion or a combination of sociometric criteria.

Rather than being concerned with reliability in terms of choices given as in Tables 1 and 2, this section is concerned with consistency of indices based on the number of choices received by each person from the group. The

TABLE 2

EXTENT OF AGREEMENT OF THE CHOICES GIVEN ON TWO ADMINISTRATIONS OF THE SOCIOMETRIC SCALES IN THE STUDIES REPORTED IN TABLE 1

Investigator	Assumptions Made in Computing Index of Conformity	Index of Conformity	Level of Significance
Criswell (13)	Size of class = 30	.55	.01
Austin & Thompson (1)	Size of class = 30	.68	.01
Scandrette (39)	Size of class = 30	.55	.01
Barker (3)	All choices other than *No change* are completely changed	.36	.01
Horrocks (25) Northway (35) Singer (41)	Size of class = 30 Per cent of *No change* is at least 48% and all other choices are completely changed	.42 or greater	.01

volume of choices received by an individual could be relatively stable while the sources of the choices change. The changing source of choices would not affect the size of the reliability coefficient.

A number of studies that assess the consistency of choice status over different periods of time have been published. The procedure usually followed in conducting these studies has been to administer a sociometric test during an early period in the history of a group and then repeat the same test on a later occasion. If choice status is unchanged at the time of the second test the correlation between the two sets of status scores should be high, but if it changes on retest the correlation should reflect this inconsistency between the two occasions.

Certain general characteristics of these studies can be summarized. The

groups have generally been composed of from 20 to 50 members, and they have most often been drawn from school classes or from military units. In addition the number of choices permitted the respondent has usually been limited to from three to five though occasionally an unlimited number of choices has been allowed. Most frequently the sociometric criterion has called for choices involving positive expressions only. Finally the time interval between test and retest has ranged from one day to one and one-half years with the typical study based on a retest after a three month period with both test and retest occurring early in the history of the group. The pertinent features of these studies are abstracted in Table 3.

The studies summarized in Table 3 are grouped in terms of the number of choices allowed. All studies based on a single choice are presented first, and those based on three, five, and an unlimited number of choices follow. Studies involving ratings of the intensity of choices and the method of paired comparisons are given in the last portion of the table. In cases where the PE's were not presented in the original report they have been computed for the purpose of permitting comparisons with other studies. Difficulties encountered in computing the probable errors were due to the fact that the kind of correlation used was not stated. In such cases the correlations were assumed to be either rank-order or Pearson product-moment. The probable errors were computed on the assumption that the correlations were rank-order because it gives the more conservative estimate of significance of the obtained value.

The results indicate that choice status obtained by an individual in a group remains essentially consistent over considerable periods of time. This statement seem to be true for the different techniques of choosing, the criteria used, and the kinds of subjects employed. These variables are discussed below.

Extent of acquaintance. The extent of acquaintance among members at first testing occasion shows some relationship to the consistency of choice status within a group. At one extreme there appears to be some minimum basis for determining the choice status position even at first contact. This is demonstrated in a study by Barker (3) in which twelve college students made ratings at the first meeting of the class with reference to the desirability of one another as seatmates. Three months later ratings were made on the same criterion and a rank-order correlation obtained between the two distributions of choices received. Under these conditions Barker obtained a correlation of .58 $\pm$ .08, suggesting that there is some consistency in response between an initial and a later rating even when there is little familiarity on which to base the first rating.

TABLE 3

TEST-RETEST CONSISTENCY OF CHOICE STATUS

Investigator	Criteria	Technique of Choosing	Subjects	Time Interval	Measurement of Status and Type of Correlation Used	r	PE	Extent of Acquaintance at First Test
Hunt & Solomon (26)	Like best	One limit choice	23 boys, 5 – 8 years	1 – 2 week	Total choices received, rank-order correlation	.70	.08	Some previous campers, some new, first week test given six hours after arrival at camp
				2 – 3 week		.75	.07	
				3 – 4 week		.91	.02	
				4 – 5 week		.94	.02	
				5 – 6 week		.88	.03	
				6 – 7 week		.77	.06	
				7 – 8 week		.95	.02	
				1 – 3 week		.42	.12	
				2 – 4 week		.61	.09	
				3 – 5 week		.84	.04	
				4 – 6 week		.74	.07	
				5 – 7 week		.82	.05	
				6 – 8 week		.82	.05	
Hemphill & Sechrest (22)	B-29 crew position	Nominations	94 B-29 crews	Unstated	Unstated	.91 "estimated"		Unstated
Bronfenbrenner (10)	Work, play, seating	Three limit choice for each criterion	14 Nursery	7 months	Composite raw scores rank-order correlation[1]	.27	.17	First test given third week in October
			20 Kndgtn.	7 months		.67	.08	
			21 1st Gr.	5 months		.48	.11	
			14 2nd Gr.	5 months		.28	.18	
			29 3rd – 4th Gr.	5 months		.52	.09	
			29 5th – 6th Gr.	5 months		.59	.08	

[1] The choices received on each criterion were correlated with the total choices received on all four criteria. These correlations are spuriously high due to the fact that the total choices received included the choices for the individual criterion with which it was correlated.

(TABLE 3 continued)

was correlated.

(TABLE 3 *continued*)

Investigator	Criteria	Technique of Choosing	Subjects	Time Interval	Measurement of Status and Type of Correlation Used	r	PE	Extent of Acquaintance at First Test
Damrin (15)	Plan dance, vacation, seating, living by, picture taken with	Three limit choice for each criterion (choices weighted 3, 2, 1)	156 girls	8 weeks	Averaged weighted choices	.86	.01	Unstated
Northway (35)	Companions for play activities	Three limit choice (choices weighted 5, 3, 2)	36 Nursery	1 month 2 – 3 month 3 – 4 month	Total weighted choices	.63 .57 .56	.07 .08 .08	Unstated
Northway, Frankel, Potashin (36)	Unstated	Unstated	Class-room groups, 20% membership change	1 year 1 week 1 week		.60 .80 .90		Unstated

(TABLE 3 continued)

Investigator	Criteria	Technique of Choosing	Subjects	Time Interval	Measurement of Status and Type of Correlation Used	r	PE	Extent of Acquaintance at First Test

Witryol & Thompson (49)	Take to another class, play with, activity in school and out of school[2]	Three limit choice	6th grade, four different classes
			  I 22
			  II 14
			  III 18
			  IV 18
				1 week	Total choices on all 4 criteria, Pearson correlation	.94
						.71
						.69
						.96
							.02
							.05
							.09
							.01
								Unstated

			I 22
			  II 15
			  III 18
			  IV 17
				4 weeks		.66
						.83
						.69
						.94
							.08
							.06
							.09
							.02	

			I 21
			  II 18
			  III 17
			  IV 17
				5 weeks		.60
						.64
						.80
						.90
							.10
							.10
							.06
							.03	

Wherry & Fryer (47)	Personality traits desirable for officer	Five limit choice	134 Army OCS	1 month 4 months	(Most)—(Least) possible	.75 .58	.03 .04	1 month
Williams & Leavett (48)	Roommate, fairness, humor, best officer, leadership	Five limit choice for best, one choice for worst	100 OCS Marines, average age 21 years[3]	3 weeks	Sum of (all) choices minus rejections	.78	.04	2 weeks in platoon

[2] Tetrachorics were computed in the study with standard errors supplied by the authors.
[3] See Table 1, footnote 4.

(TABLE 3 continued)

(TABLE 3 *continued*)

Investigator	Criteria	Technique of Choosing	Subjects	Time Interval	Measurement of Status and Type of Correlation Used	r	PE	Extent of Acquaintance at First Test
Zolany (52)	To work in groups	Five limit choice	15 college students, 35 college students, 34 college students	1 day	Choices	.95, .94, .94	.03, .02, .02	Unstated
McIntyre (30)	Roommate, sharing of recreation	Five limit choice	One floor of men's college dormitory, (approx. 70)	6 months	Pearson	.65	.05	2 months in dormitory
Donney (9)	6 – 8 choosing situations (i.e., send Valentine to, vote for class officers, vote for librarian)	Choice mostly unlimited (choices weighted 5, 4, 3, 2, 1)	48 children, in 2nd grade, two 3rd grades 42 – 57 children (30% turnover)	1 year	Total weight-ed choices as a per cent of class total	.84, .77, .67	.02, .04, .05	Unstated
Byrd (11)	Actors for play	Unlimited choice	27 4th grade	2 months	Rank-order of total choices	.89	.04	2 months
Jennings (27)	Working, living	Unlimited choice and unlimited rejection	133 girls 12 – 16 yrs. N.Y. Training School	8 months	Total choices minus total rejections	.65, .66	.04, .04	Various

(TABLE 3 continued)

Investigator	Criteria	Technique of Choosing	Subjects	Time Interval	Measurement of Status and Type of Correlation Used	r	PE	Extent of Acquaintance at First Test
French (17)	Go on liberty with, volunteer for tough assignment with, for Acting Chief Petty Officer	Unlimited choice	16 companies (42–54 men per company) Naval recruits 17–20 years	9 weeks 8 weeks 5 weeks	Number of choices	(see subtable below)		1 week

Correlation With Final Test (10th Week) by Companies

Week of Initial Test	Company	Liberty		Mission		Leader		Total	
First week	102	.38	.08	.53	.07	.63	.06	.54	.07
	103	.49	.09	.72	.05	.69	.05	.43	.08
	104	.63	.06	.79	.04	.83	.03	.83	.03
	105	.28	.09	.40	.08	.35	.09	.27	.09
	Mean	.46	.08	.64	.06	.66	.06	.56	.07
Second week	98	.43	.08	.48	.08	.60	.06	.56	.07
	99	.40	.08	.36	.08	.54	.07	.41	.08
	100	.62	.06	.57	.07	.83	.03	.71	.05
	101	.56	.07	.65	.06	.90	.02	.75	.04
	Mean	.51	.07	.53	.07	.76	.04	.63	.06
Fifth week	94	.76	.04	.89	.02	.88	.02	.86	.03
	95	.82	.03	.81	.04	.87	.03	.86	.03
	96	.82	.03	.82	.03	.82	.03	.84	.03
	97	.78	.04	.92	.02	.96	.01	.93	.01
	Mean	.80	.03	.87	.03	.90	.02	.88	.02

(TABLE 3 continued)

(TABLE 3 *continued*)

Investigator	Criteria	Technique of Choosing	Subjects	Time Interval	Measurement of Status and Type of Correlation Used	r	PE	Extent of Acquaintance at First Test
Gibb (18)	I Group members (sociotelic) II Personal friends (psychotelic) III Influence	Unlimited choice	10 groups college men (10 each) 20 groups officer candidates (10 each)	3 sessions 3 hrs. each —unstated interval	Tetrachoric coefficients, standard error	(See subtable below)		Unstated
Murray (33)	Best friends	Unlimited choice	43 retarded children	12 weeks 12 weeks	Choices received	.33 .50		Average of 14 months
Zeleny (51)	Work in groups	Rating of yes, no, indifferent; three limit choice	3 college classes (29 in each)	1 day 6 days	Weighted sum of rankings received	.95 .96 .96 .94 .97 .96	.01 .01 .01 .01 .00 .00	Unstated

	Officer Candidates		Students	
Sessions	1 & 2	2 & 3	1 & 2	2 & 3
I	.45	.50	.66 .07	.78 .09
II	.77	.64	.80 .06	.78 .09
III	—	—	.83 —	.78 —

(TABLE 3 *continued*)

Investigator	Criteria	Technique of Choosing	Subjects	Time Interval	Measurement of Status and Type of Correlation Used	r	PE	Extent of Acquaintance at First Test
Zeleny (52)	Like	Rating of yes, no, indifferent	15 college students	1 day	Likes or acceptances received	.91	.03	Unstated
			35 college students			.91	.02	
			34 college students			.95	.01	
Zeleny (53)	Like	Rating of yes, no, indifferent; first three choices and last three choices	20 4th grade students	5 days	Weighted sum of rankings received	.79	.06	Unstated
Barker (3)	Desirability as a seatmate	Rating of pleased, indifferent, sorry	12 college students	3 months 36 class meetings	Rank-order, composite group rating	.58	.08	Strangers
McKinney (31)	Members of discussion group	Rating of yes, no, indifferent; check positive negative reasons	29 9th grade	2 weeks	Rank-order, $\dfrac{\text{Yes} - \text{No}}{N-1}$ positive minus negative reasons	.94	.02	Unstated
						.97	.01	

(TABLE 3 *continued*)

Measurement of

Extent of

(TABLE 3 continued)

Investigator	Criteria	Technique of Choosing	Subjects	Time Interval	Measurement of Status and Type of Correlation Used	r	PE	Extent of Acquaintance at First Test
Seeman (40)	OSAS (friend-ship)[4]	Rating on 1 – 6 point scale	5th grade approx. 40	"Re-test"	Pearson, mean scores	.90	.02	Unstated
Taylor, E. (43)	OSAS friend-ship	Rating on 6 point scale ratings (weighted 15, 10, 5, 2, 1)	8th grade; 31 traditional students, 32 unclassified students, 27 progressive students	4 months 3 months 3 months	Weighted scores	.90 .89 .66	.02 .03 .08	Unstated
Wherry & Fryer (47)	10 leader-ship qualities	Rating	134 Army OCS's in two classes of 82 and 52 members each	1 – 2 months 1 – 5 months	Averaged ratings	.76 .17	.03 .06	1 month
Lippitt (29)	Like best	Paired com-parison	13 nursery children selected from 5 others; 10 nursery children	1 – ½ months	Rank-order of choices	.64 .50	.20 .17	Unstated

[4] The Ohio Reputation Scale is composed of short descriptive items concerning reputation. Choices were made as to individuals within the group that fitted the descriptions given on the scale.

(TABLE 3 continued)

Investigator	Criteria	Technique of Choosing	Subjects	Time Interval	Measurement of Status and Type of Correlation Used	r	PE	Extent of Acquaintance At First Test
Witryol & Thompson (49)	Like best	Paired comparison	6th grade, four different classes		Pearson			Unstated
			I 25	1 week		.98	.01	
			II 20	1 week		.99	.00	
			III 19	1 week		.96	.01	
			IV 21	1 week		.97	.01	
			I 25	4 weeks		.93	.02	
			II 20	4 weeks		.98	.01	
			III 19	4 weeks		.92	.02	
			IV 21	4 weeks		.97	.01	
			I 25	5 weeks		.94	.02	
			II 20	5 weeks		.96	.01	
			III 19	5 weeks		.90	.03	
			IV 21	5 weeks		.95	.01	

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The relationship between the amount of acquaintance and the degree of consistency between choices received is reported in a study by Hunt and Soloman (26). Sociometric choices of boys in a summer camp were correlated on a week-by-week basis from the first and second week to the seventh and eighth week. The correlations between successive weeks increased in magnitude with time. They were lowest at the beginning of the camping session and higher between successive weeks later in the session. As the degree of acquaintance between group members increased the size of the correlations between choice distributions increased.

This generalization is given further support in a study by French (17) in which choices were made by sixteen companies of Naval recruits at the end of the first, second, fifth, and tenth weeks of training. Several different sociometric criteria were used as the basis for measuring choice status. With an increase in the amount of acquaintance prior to the first test there was a consistent increase in correlations of choices received on the first and final occasions. In general, the lowest correlations were obtained between the tests taken at the end of the first and tenth weeks, with higher correlations being obtained between the second and tenth weeks, and the highest correlations found between choices received at the end of the fifth and tenth weeks of training.

Relevance of criteria and consistency of status. There is some evidence that the more relevant the criterion of choice is to the purpose for which the group meets the more consistent the measured status positions between testing occasions. This set of relationships is suggested in the study by French (17) cited above. Choices received on the criterion of "going on liberty with" yielded lower retest correlations than the choices received on "volunteering for a tough assignment," and choices received on the criterion of "Acting Chief Petty Officer" yielded higher correlations than either of the other two criteria. This conclusion is only tentative since there was no independent means by which to assess the relevance of the criteria to the purpose for which the groups were organized.

Age of subjects. The stability of choice status may be determined in part by the age of the subjects making the choices. The statement that relates these variables to one another is that the closer the subjects are to adult age the more stable their choices and the higher the resulting correlation between tests. The studies using older children as subjects report higher retest correlations than studies using nursery and kindergarten age children as subjects. This possibility can be evaluated by contrasting studies reported by Bronfenbrenner (10), Lippitt (29), and Northway, Frankel, and Potashin

(36) all of which deal with nursery and kindergarten children with those by Bonney (9), McKinney (31), Seeman (40), Taylor (43), Byrd (11), and Zeleney (51), a series of studies using older children as subjects. By comparison with these investigations, studies based on the sociometric responses of college students and adults such as those by Zeleny (51) (53) and Hemphill and Sechrest (22) yielded the highest test-retest correlations. The interpretation here is complicated by the fact that the time interval was also much shorter. Although there are studies in the table which appear to produce results which are inconsistent with this interpretation, the generalization seems valid that the choice status received by older children and young adults is more stable. The studies relevant for making this interpretation are not equated with respect to other factors such as time interval between test and retest, relevance of criteria, and technique of choosing which also appear to be significantly related to the test-retest correlation.

Technique of choosing. The consistency of choice status over a period of time appears to vary with the technique of choosing. This was investigated directly in a study by Witryol and Thompson (49). Both the paired comparison technique and various sociometric choosing situations were used with four classes of sixth grade children. The tests were given at one, four, and five week intervals, and the sociometric choices for the various choosing situations were combined into a total score. The results show that the paired comparison technique gave the higher and more consistent correlations over the various time intervals covered by the study.

Time interval between test and retest. A general statement with respect to time interval is that the longer the period elapsing between test and retest the lower the resulting correlation. With the exception of the study reported by Taylor (43), the general validity of this statement is shown in investigations by Northway (35), Northway, Frankel, and Potashin (36), Wherry and Fryer (47), French (17), Lippitt (29), Hunt and Soloman (26), and Witryol and Thompson (49). In these studies the longer the time interval between two testing occasions the greater the possibility that changes in interpersonal attitudes will occur. Such changes would be reflected by differences in sociometric choices which might have the effect of lowering the correlation for status positions between test and retest.

Summary. Granting the general consistency reflected by the test-retest correlations, there appear to be several contributing factors that are related to their magnitude. These include the extent of acquaintance, the relevance of the choice criterion to the activity of the group, the age of subjects, the technique of choosing, and the time interval between test and retest.

CONSISTENCY OF CHOICE STATUS WITHIN A SINGLE TEST OCCASION

The problem of the consistency of choice status has been approached in still a different way by analysis of data within a single test occasion. When this procedure is used the number of choices received by each person from one half the group is contrasted with the number of choices received from the other half. This method of analysis resolves many of the technical problems of evaluating consistency such as the independence between administrations and so on. The studies using this method that have been reported are summarized in Table 4.

The studies in Table 4 are consistent with those described in Table 3. Regardless of the technique of computing the index of agreement for choice status received, whether from data representing choices received on two different occasions or from data obtained on a single testing occasion, the studies agree in demonstrating that sociometric assessments have a significant degree of reliability.

INTERCORRELATIONS AMONG TECHNIQUES

The consistency of sociometric data can also be evaluated by contrasting results obtained with different sociometric measurement techniques administered in succession. One could employ two different techniques of gathering sociometric choices on the same criterion and then study the extent of agreement between them; for example, the results by the method of paired comparisons can be contrasted with those from a limited direct choice technique. If the status positions given by both techniques are roughly comparable the intercorrelation between these two ways of measuring status would yield a value which should be at least as high as the reliability coefficient of the least reliable of either of the two techniques. If status position as assessed by one technique is distinctly different from that obtained through use of a second, then the intercorrelation between the measures would be lower. In the latter case it would have to be assumed that the resulting index of status for an individual is contingent upon the technique used in measuring it; whereas in the former the status could be treated as essentially independent of the procedure employed in assessment.

Four different studies which are concerned with intercorrelating different techniques of measuring status position are summarized in Table 5. The same categories have been used in Table 5 as were used in previous tables. Twelve different pairs of combinations of techniques of choosing are represented. Frequently the technique for computing the correlations reported in Table 5 was not indicated. In these cases the same procedure as was used

TABLE 4

CONSISTENCY OF CHOICE STATUS WITHIN A SINGLE TEST OCCASION

Investigator	Criteria	Technique of Choosing	Subjects	Type of Correlation Used	Correlation	Extent of Acquaintance
Grossman & Wrighter (19)	Seating, **Walking** home, playing, class officer, best friend	Three limit choice	4 classes of 6th grade N = 117	Spearman-Brown split-half	.93 .96 .96 .97	Unstated
Bass & White (4)	7 sociometric items	Rating	75 frat. members	"Correlated split-half" for 7 items	.90 or above	Unstated
Ricciuti & French (38)	Leadership potential or aptitude for service	Rating	633 Naval Academy Midshipmen	Split-half method (composite ratings)	.90	Cruise
Taylor, F. (44)	Friend, like	Rating	3 therapy groups 7 females, 9 males 4 males and 4 females	W	.72 .54 .52	3 months acquaintance
Heinicke & Bales (21)	Leadership	Ranking	College students high consensus groups 6 gr. N = 5 4 gr. N = 6	W	.500 or higher	Not acquainted at beginning of 6 week interaction

to evaluate the reliability coefficients in Table 3 was employed in computing the PE's. The rank-order correlation was assumed because it gives the more conservative estimate of the significance of the reliability coefficient.

The correlations in Table 5 are statistically significant, but some pairs of techniques seem to produce much higher intercorrelations than others. The technique that produces the lowest intercorrelations with other measures is apparently the two or three limit fixed choice. It seems that the larger the number of choices allowed including unlimited choices the higher the correlation between the measures and the greater the consistency of the derived index of status position. In order to make these generalizations, however, the results of several studies must be combined and reference made to Table 3 as well as Table 5.

The study by Witryol and Thompson (49) referred to in Table 3 shows that for four classes of 6th graders the paired comparison technique yielded higher retest correlations and showed less fluctuation as the basis for measuring status position than did the three choice technique. This finding suggests the the test-retest consistency of paired comparison data is greater than that for three limit choice data. On the other hand, in view of the correlations between these two measures shown in Table 5, it can be inferred that the variations in the correlation coefficients appearing there seem to be associated with the three choice technique and its lower reliability. These two considerations taken together lead to the tentative statement that the paired comparisons technique may be the more stable of the two procedures for the measurement of choice status. This possibility is given further support by results reported by Eng and French (16). They found that the paired comparison technique yielded consistently high correlations with unlimited choice and mean rank, and lower correlations with the two and five limit choice technique.

The results of the Taylor (44) (45), Eng and French (16), and Ausabel, Schriff, and Gasser (2) studies can also be contrasted with one another from the point of view of this possibility. The correlations between ratings and rankings are high (Taylor), between rankings and limited choices (Eng and French) and between choices and ratings (Ausabel, Schriff, and Gasser) are comparatively low. From these results it can be inferred that the limited choice technique is the common factor responsible for the lower intercorrelations. This interpretation is given further support by the Eng and French study where the limited choice technique showed the lowest correlations of any technique with the several other measures. This finding is not unexpected, as each member makes judgments on only a portion of

TABLE 5

INTERCORRELATIONS AMONG TECHNIQUES

Investigator	Criteria	Technique of Choosing	Subjects	Time Interval	Five limit choice r	PE	Two limit choice	Extent of acquaintance at first test
Eng & French (16)	Desirability as a roommate	Unlimited choice[1] vs. paired comparison vs. rank-order	32 sorority members	3 sessions at 1 week intervals	(See subtable below)			Unstated
Taylor, F. (44) (45)	Like as a friend	Rating (+1, −1, 0) vs. preference ranking	3 psychotherapy groups; 7 females; 4 males and 4 females; 9 males.	Administered in succession	.91	.02		3 months
					.95	.02		5 months
Ausubel, Schiff & Gasser (2)	Friendship	Three limit choice vs. ratings (1 – 5 points)	2 classes – 3rd grade; 2 classes – 5th grade; 2 classes – 7th grade; all classes – 11th grade; all classes – 12th grade	Administered in succession	.73	.05		Unstated
					.29	.10		
					.42	.07		
					.42	.08		
					.49	.07		

Subtable (Eng & French):

	Mean rank		Unlimited choice		Five limit choice		Two limit choice	
	r	PE	r	PE	r	PE	r	PE
Paired comparison	.97	.01	.90	.02	.73	.06	.54	.09
Mean Rank			.89	.03	.74	.06	.55	.09
Unlimited choice					.78	.05	.65	.07
Five limit choice							.75	.06

[1] The unlimited choosing situation was presented as the first technique with the choices ranked in order of preference. The first and second choices of each were used as the data for computing the status on the two choice category. The rank-order of preference was the third technique used and the first five choices were used for computing the status in the five choice category.

(TABLE 5 continued)

Investigator	Criteria	Technique of Choosing	Subjects	Time Interval	r	PE	Extent of acquaintance at first test
Witryol & Thompson (49)	Like least, take to another class, play with friends, activities in school and out of school	Paired comparison, vs. three limit choice	I 23 6th grade classes	1 day	.82	.05	Unstated
			II 15	1 day	.41	.15	
			III 19	1 day	.67	.09	
			IV 18	1 day	.89	.03	
			I 23	1 week	.80	.05	
			II 19	1 week	.77	.07	
			III 18	1 week	.36	.14	
			IV 18	1 week	.90	.03	
			I 23	5 weeks	.64	.08	
			II 19	5 weeks	.62	.09	
			III 18	5 weeks	.54	.11	
			IV 20	5 weeks	.86	.04	

the scale with the limited choice technique, and the part of the scale not covered by his choices is assumed to be compatible with the judgments of others.

INTERCORRELATIONS AMONG CRITERIA

Another way to evaluate the consistency of choice data on a single occasion involves examining the intercorrelations of criteria. Given the same technique of choosing, to what extent is status position as measured on one criterion related to status position as measured on a second criterion?

Assuming that the choice process is differentiated for various criteria, a justification for this kind of analysis can be seen in terms of the functional equivalence of the items which serve as the basis for choice. If essentially the same basis for choice characterized two criteria which are stated in different verbal terms then it would be expected that if the choice process for the two criteria is the same or similar the correlation between them should be high. Furthermore, correlations should be low for the items which are not functionally equivalent. The difficulty in making this kind of analysis is that there is no independent means by which functional equivalence of sociometric criteria can be established. Under these conditions more functional equivalence is likely to be assumed for those items that produce high intercorrelations and less functional equivalence assumed for those that do not. In the absence of a measure in terms of which equivalence can be independently determined, it will be possible only to point out where the intercorrelations appear to be consistent with *a priori* assumptions of the degree of functional equivalence of items.

The data presented in Table 6 are difficult to interpret for additional reasons. Studies showing substantial intercorrelations among choice criteria are not equated in terms of other variables. In some cases a complication stems from the fact that different techniques of choosing were used for the different criteria thereby making it difficult to determine whether the obtained results are to be attributed to differences in the functional equivalence of criteria or to differences in the technique of choosing. As in Table 5, where the type of correlation coefficient was not indicated PE's were computed for the rank-order method.

There is some degree of positive intercorrelation among all choice criteria. This finding suggests that the choice process is rather general with the same persons receiving a higher number of choices even when the criteria for choosing are different. In addition to consistently significant intercorrelations between positive choices, Table 6 can also be interpreted as showing that the more psychologically similar the two criteria the higher the result-

TABLE 6

INTERCORRELATIONS AMONG CRITERIA

TABLE 6

INTERCORRELATIONS AMONG CRITERIA

Investigator	Criteria	Technique of Choosing	Subjects
Young (50)	OSAS[1] ORS,[2] composite sociometric score based on criteria of sit with, help with school work, president of class, play on team, go on picnic, stay all night (at home), best friend	Rating Nomination Two limit choice	41 7th grade students
Williams & Leavitt (48)	Roommate, sense of humor, leadership, fairness, best officer	Five limit choice for best and five limit choice for worst	100 OCS Marines (18 – 26 years average age 21)

Young (50):

	ORS		Sociometric Composite	
	r	PE	r	PE
OSAS	.83	.03	.90	.02
ORS			.88	.03

Williams & Leavitt (48):

	H		L		F		O	
	r	PE	r	PE	r	PE	r	PE
R	.56	.05	.78	.03	.95	.01	.69	.04
H			.11	.06	.58	.04	.39	.05
L					.94	.01	.95	.01
F							.85	.02

[1] See Table 3, footnote 4.
[2] The Ohio Reputation Scale is composed of short descriptive items concerning reputation. Choices were made as to individual's within the group that fitted the descriptions given on the scale.

(TABLE 6 continued)

Investigator	Criteria	Technique of Choosing	Subjects	r	PE		II		III		IV
McKinney (31)	Membership in discussion group, personal appraisal	Ratings (+1, 0, −1) Choice of positive and negative reasons	27 9th grade students	.96	.01						
				.98 (retest two weeks later)	.01						
Maucorp (32)	I Toward which members feel most drawn	Unlimited choice (+1) 3 highest indicated (+3); eight limit choice;	35 French officers at special training school	I			.81 .04		.74 .05		.84 .03
	II Work in groups	Choice, 3 highest, 3 next highest, 3 lowest indicated (weighted +3, +1, −3);		II					.90 .02		.89 .03
	III Team for final exam	Unlimited choice (+1)		III							.89 .03
	IV Posted with at head-quarters	Unlimited choice (+1) 4 highest (+3)									
Smucker (42)	Best friends and rejections, represent college	Unlimited choice and rejection, four limit choice	Girl's dormitory (approximately 75)	.64							

(TABLE 6 continued)

(TABLE 6 continued)

Investigator	Criteria	Technique of Choosing	Subjects	r	PE
Gibb (18)	Sociotelic group members, psychetelic – personal friends, influence leaders	Unlimited choice	10 groups college men (10 in each) 20 groups officer candidates (10 in each)		
Hackman & Moon (20)	Leader of a committee, committee members	Two limit choice	2 laboratory sections of college students	Influence .86 Leader .85	
Holzberg (23)	I Debating II Planning party III Student council representative IV Make a decision for you	Five limit choice and rejections with weighting	47 student nurses (20–22 years)		

Gibb (18) data:

Officer Candidates

Sociotelic

Sessions	1	2	3
Influence	.38	.10[3] .46 .09	.65 .08
Leader	—	—	.59 .11

Psychetelic

	1	2	3
Influence	—	.54 .09	.64 .08
Leader	—	—	.65 .10

College Students

	Sociotelic	Psychetelic
Influence	.53 .13	.30 .15
	.25 .16	.36 .15

Holzberg (23) data:

	II	III	IV
I	.86	.85	.79
II		.83	.81
III			.67

[3] Tetrachorics were computed in the study with standard errors supplied by the authors.

(TABLE 6 continued)

Investigator	Criteria	Technique of Choosing	Subjects	r		PE
Taylor, F. K. (45)	I Liking II Public popularity III Influence of group	Rank-order Ratings (+1, −1, 0) Ratings (+1, −1, 0)	Combined three psychotherapy groups; 7 females; 4 males and 4 females; 9 males			

For Taylor, F. K. (45):

	III	
I	.92	.02
II	.57	.16

Investigator	Criteria	Technique of Choosing	Subjects	r	PE
Bates (5)	Contributing most to group task, effective leaders	Rank-order, three limit choice	18 college	.83	.05

Investigator	Criteria	Technique of Choosing	Subjects
Chowdhry & Newcomb (12)	I Most capable as president II Most influential III Represent group at convention IV Like as friends	Three limit choice[4]	4 groups: 34 in Religious Group 30 in Political Group 36 in Medical Fraternity 46 in Medical Sorority

	I		II		III		IV	
R	.95	.01	.89	.03	.81	.04	.67	.07
P	.96	.01	.97	.01	.84	.04	.95	.01
F	.87	.03	.70	.06	.53	.09	.86	.03
S	.96	.01	.93	.01	.61	.10	.68	.06

[4] The choices received on each criterion were correlated with the total choices received on all four criteria. These correlations are spuriously high due to the fact that the total choices received included the choices for the individual criterion with which it was correlated.

(TABLE 6 continued)

Investigator	Criteria	Technique of Choosing	Subjects
Wardlow & Green (46)	I Review for a quiz (mental)	Three limit choice (weighted 3, 2, 1 points)	37 adolescent girls in 1st year home-making
	II Weiner roast (social)		
	III Play basketball (physical)		
	IV OSAS (friendship)	Rating (1–6 points)	
	V ORS (reputation)	Choice *	

| | r PE | | | | | | | | | |
| | M | | P | | S | | ORS | | OSAS | |
	r	PE	r	PE	r	PE	r	PE	r	PE
M			.32	.10	.61	.07	.52	.08	.61	.07
P					.57	.08	.52	.08	.60	.07
S							.39	.10	.51	.08
ORS									.50	.08
Mean Correlation	.52	.08	.51	.08	.52	.08	.49	.09	.56	.08

ing correlations between them. This is borne out in the study by Williams and Leavitt (48) where the intercorrelations of "roommate," "leaders," "fairness," and "best officer," are consistently high. With criteria that appear to be less closely related the intercorrelations of status position is lower. This is shown in the same study where the criteria when correlated with "sense of humor" criterion yielded the lowest intercorrelations. In the case of the study by Smucker (42) where the two criteria are "best friends" and "representatives of the college," the resulting intercorrelations of status position are somewhat low.

The same finding appears in the study by Wardlow and Greene (46) where criteria based on social relations are more highly intercorrelated than are judgments based on physical abilities. Examples of studies in which intercorrelations are high and in which the criteria are functionally closely related to one another are those published by Bates (5), Maucorp (32), McKinney (31), and Young (50).

CONSISTENCY OF SOCIOMETRIC JUDGMENTS UNDER CONDITIONS OF EXPERIMENTAL VARIATION

Two investigations deal with the problem of consistency of sociometric judgments of personal and social characteristics when factors that might produce a spuriously high correlation between the two testing occasions have been systematically excluded. Both investigations report evidence supporting the view that individual characteristics can be judged consistently under these conditions.

The first study reported by Bell and French (6) used twenty-five previously unacquainted student volunteers from an introductory course in psychology. Over a six week period each subject participated in six five-man discussion groups with each group composed of five men who had not met previously. This procedure required a total of 30 thirty-five minute group discussions with a different topic for discussion at each meeting. At the end of each session, the participants were asked to rank the group members for the position of discussion leader in a hypothetical second meeting of the group. Bell and French show that the rankings an individual received in any one group in which the member participated are significantly related to his average ranking in the other five groups, with the average correlation being .75. They conclude that leadership status would seem to be a stable individual characteristic with seventy-three per cent of its variance measured reliably, and that .75 is probably a minimum estimate due to sources of unreliability in the measurements themselves. In other words, if the measures

themselves were completely reliable the consistency of judgments in the individual situation with the average of the judgments in the other five groups might have been as high as .91.

A second study dealing with the consistency problem in the same general way is that by Blake, Mouton, and Fruchter (7). In this investigation, thirty-three college students who were unacquainted with one another at the beginning of the experiment were organized into eleven three-man discussion groups for a fifteen minute discussion period. They were then reorganized into new groups so that no person worked in the second test situation with another person whom he had previously known in the first situation. In addition to changes in group membership the discussion topic also was changed in the second session. Finally the trained observers who watched each group during the first period observed the discussion of three different people during the second session. Both subjects and observers were asked to rank the performance of the members on a twelve item scale of personal and social characteristics that was filled in after each session. These data permit determination of the extent to which personal and social characteristics are reliably judged from one discussion situation to another when the discussion topic, group membership, and the observers are changed. The results support the proposition that judgments of behavior under conditions of short-term interaction can be reliably made even when factors that might produce spurious consistency between judgments have been systematically eliminated. Items that were most reliably judged were leadership, contribution to group decision, and dominance position within the group.

Both the Bell and French and the Blake, Mouton, and Fruchter studies agree in demonstrating that it is possible to make judgments of individual personal and social characteristics that are consistent from one occasion to the next even where the group membership and discussion topic are different in each of the sessions.

DISCUSSION AND SUMMARY

This paper has dealt with the problem of assessing the reliability of sociometric judgments. By way of introducing the issues involved in this question a typical social situation within which such judgments might be made was described, and the alternative arguments as to whether or not such judgments should be consistent over time was discussed. This was followed by an analysis of the use of a time measure between testing occasions as the basis for assessing the degree of consistency in such judgments. Other problems which arise in assessing the reliability of sociometric data include the problems involved in assuming independence between the adminis-

trations of the same sociometric technique, the introduction of administrative changes based on the sociometric judgments given at the first administration as these changes might affect the responses given on the second occasion, the differences in the techniques of measurement or the number and ordering of the choices given, and finally the methods used in computing the index of reliability were discussed.

A total of 53 studies bearing on the reliability of sociometric judgments were then summarized under six different headings. The basis for classification was the way in which consistency was investigated whether from the standpoint of the consistency of choices given between two testing occasions, the consistency of choice status received from a single test administration or from two test occasions spaced by a time interval, the degree of intercorrelation between different techniques of measuring choice status, or the intercorrelations of the different sociometric criteria used as the basis of choice. In the final section the studies were concerned with experimental manipulation of the conditions under which the sociometric judgments were made.

Two important generalizations can be stated on the basis of the studies of the consistency of sociometric judgments that have been reported. The first is that it is possible for group members to make consistent judgments. The second is that there are factors that seem to be associated with the magnitude of the reliability of these judgments.

That reliable judgments can be made over a wide range of conditions has been demonstrated in a number of different ways. One series of investigations has shown that choices, when evaluated in terms of their source, are consistently made. This means that the choices a person gives on one occasion are likely to be duplicated on a second administration of the same criterion. Another way in which consistency has been demonstrated involves stability in terms of the number of choices received. This has been investigated both in terms of the consistency of choices received, with a choice status index based on a single test occasion, and the consistency between indices based on the number of choices received on two different occasions. The findings lead to the conclusion that the choice status characteristic of a person is rather constant over time.

The consistency issue has also been examined from the standpoint of the technique used in collecting the choice data. The technique may involve unlimited or fixed choice, the paired comparison procedures, or ranking and rating methods. Each of these has produced reliable data, but there is some evidence that when other factors that might influence the results are rendered inoperative the paired comparison method produces the most reliable choices.

Various criteria have also been intercorrelated to determine the extent of agreement between them as the basis for judging the consistency of choice responses with the finding that as long as the basis for choice is positive or involves a positive attribute consistency of judgments seems to be the rule.

Finally, two experimental studies that manipulated the conditions under which choices were given have been reported. These studies, which present the most rigorous analysis of reliability that has yet been made, agree in showing that when factors that could produce spurious agreement between the two sets of sociometric judgments are systematically excluded a significant relationship between independent assessments of the same person's performance on different occasions remains.

The second general conclusion is that certain factors seem to be associated with the magnitude of the consistency of sociometric judgments that is obtained. While not all these factors have been subjected to critical experimental analysis, enough evidence concerning these relationships is available to justify their presentation in a series of testable hypotheses. These are listed below.

HYPOTHESES

1. The longer the time interval between test and retest the less the consistency of sociometric judgments.

2. The closer the age of the subjects to adulthood the more the test-retest consistency of sociometric judgments.

3. The longer the subjects have known one another prior to the first test the greater the consistency in sociometric judgments between test and retest.

4. The more relevant the criterion of choice by which judgments are made to the activity of the group the greater the consistency of sociometric responses between test occasions.

5. The larger the number of discriminations required by the techniques of choosing the greater the consistency of sociometric judgments between test and retest.

6. The larger the group from which choices are made the greater the consistency in sociometric judgments between test occasions.

7. The larger the number of discriminations elicited by the measurement technique the greater the correlation between the measures derived from those techniques on a single occasion.

8. Where strength of choice preference is indicated by the ordering of choices the stronger the choice the less the change in choices given between test occasions.

9. The greater the similarity of criteria of choosing in terms of social-psychological considerations the larger the correlations between them.

These hypotheses need to be subjected to further empirical investigation in order to establish more clearly the conditions under which they are valid. In addition, experiments are needed to identify other factors that may be critical with regard to reliability of sociometric data even though studies reported to date have not identified them.

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AN INVESTIGATION INTO SOME CORRELATES OF SOCIOMETRIC STATUS WITHIN SCHOOL CLASSES[1]

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I. INTRODUCTION AND PROBLEM

Research along sociometric lines, which has for a number of years been thriving in Canada and the United States, has been conspicuously absent in this country. The present research forms an attempt to remedy this defect. Such an attempt is necessary for the very good reason that the influence of cultural forces on the personality correlates of sociometric status or popularity may be much greater than many writers would be inclined to admit. There is, however, another reason. Almost all investigators in this field have confined their attention to the relationship between sociometric status scores and scores on this or that questionnaire or inventory. What is clearly lacking is a knowledge of the link between popularity on the one hand, and something more than a questionnaire on the other. For this latter the personality dimension of neuroticism (Eysenck, 1947, 1952, 1953) is here utilized.

There are thus two main aims. The first is to relate sociometric status or popularity to the following variables with a view to throwing some light on the possible effects of cultural influences.

    (i)   Age
    (ii) Intelligence
    (iii) Number of siblings
    (iv) Position in family

The second is to relate sociometric status to neuroticism—postulated by Eysenck as an important personality dimension.

A third and minor aim is to assess the effects of age, intelligence, and sex on the above relations. This aspect has been almost completely ignored by most writers.

II. METHOD

(A) Subjects.

Thirty-four complete school classes were selected for study, one class

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[1] Based on the writer's Ph.D. Thesis, "A Sociometric Study of London Schoolchildren." University of London Library, 1953.

from each of thirty-four schools. The schools were mainly Secondary Modern. More detail regarding the selection of schools and composition of classes will be found in the writer's thesis (Thorpe, 1953). The total number of subjects in these classes was nine hundred and eighty, of mean age twelve years eight months, with a standard deviation of sixteen months.

(B)   Tests.

(i)   The Sociometric:

The test used was a modified version of the ones given by Northway (1942) and Jennings (1948). The sociometric criteria considered suitable for the subjects under investigation were:

(a)   sitting by in class (three choices in order of preference)
(b)   playing with at break (three choices in order of preference)
(c)   taking home to tea (three choices in order of preference).

The test also required each pupil to name the one member of the class whom he liked least of all. To pupils finding difficulty in answering this item it was pointed out that if they put down the names of everyone present in the order in which they liked them, someone's name would have to be at the bottom of the list. This was the name they had to put down.

The inclusion of this item and the importance of obtaining an answer to it was bound up with eventual statistical treatment of the data. A child's score on this test was the total number of times he was chosen minus the number of times he was mentioned as liked least of all. The distribution of these scores was found to be more nearly normal than the usual score— the number of times chosen.

(ii)   Intelligence:

As a measure of intelligence Thurstone's Primary Mental Abilities was employed (11-17 year version). The five subtests V.S.R.N.W. were treated separately.

(iii)   Neuroticism:

Measurement along this dimension was effected by means of the following tests:

(a)   Annoyances (A). This test contained sixteen items of the kind: "Harry was going upstairs when he slipped." The subject has to tick those items which would annoy him if the incident happened to him. The score was the number of items ticked.

(b)   Worries and Anxieties (W.A.). A list of thirty items is presented to the subject who underlines those items which have ever worried him.

Typical of these items are lifts, accidents, and forgetfulness. The score is the number of items underlined.

(c) Ways to Be Different (W.T.B.D.). This test contains eighteen items each one depicting a child wanting to be different in some way, e.g., older, better looking, or to have more friends. The total number of items ticked as in (a) above is the score.

(d) Interests (I). Thirty items are presented, and the subject has to underline those in which he is interested. The total number of interests is the subject's score.

(e) Questionnaire (Q). This is an adaptation of the Maudsley Medical Questionnaire (Eysenck, 1947). Twenty-four tems are included and are of the type "Do you often have bad dreams?". The number of yeses is the subject's score.

(f) Sentence Completion Test (S.C.T.). Twelve neutral sentence beginnings have to be completed. "The children at school ———" is one of the twelve. The scoring of this test is subjective, answers having to be labelled "healthy," "neutral," or "unhealthy." However, the correlation between two markings, each by a different person, of a hundred tests was .81. The subject's score is the number of unhealthy sentence endings.

(g) Word Likes and Dislikes (W.L.D.L.). Thirty words are presented and the child had to indicate by placing an "L" or a "D" after each word whether he likes or dislikes the word. Amongst the words are teacher, fireworks, and potatoes. The total number of words disliked forms the subject's score.

All the above tests or similar versions thereof have been shown to discriminate between normal and neurotic subjects by Bennett (1945), Slater (1945), Himmelweit and Petrie (1951), and Connor (1952). The inter-correlations of these tests, being mainly positive, may be considered to define a factor of neuroticism.

(iv) Miscellaneous. Each child also filled in an information slip. In this way details of the child's age, sex, position in family, and number of siblings were obtained.

All the above tests were administered to each of the thirty-four school classes. The procedure was to start off with the P.M.A. which usually lasted until play time, after which the rest of the tests were administered. In all the testing time worked out at about two and a half hours per class.

(C)   Statistical Treatment.

First the thirteen variables comprising seven questionnaires, five P.M.A. subtests and age were intercorrelated and age was partialled out of the resulting matrix of correlations. The partial correlation matrix was factored by the centroid method and four factors emerged leaving non-significant residuals on Tucker's criterion. The fourth factor, accounting for only 3% of the variance was omitted from the extended vector rotation which followed. With the first three factors rotated into oblique simple structure, neuroticism and intelligence were readily identified. These two factors correlated together —.387. The third factor, being irrelevant to the present study was not considered.

The factors having been obtained, factor scores were calculated for every one of the nine hundred and eighty children on each of the factors intelligence and neuroticism. Correlations were then run between sociometric status scores and intelligence, and sociometric status scores and neuroticism for each class taken separately. In this way, as school classes are relatively homogeneous in respect of age, the correlations found between age and each of the factors were eliminated.

Correlations were also run between sociometric status and the following, again for each school class taken separately:—age, size of family, and position in family.

The school classes differed from one another in respect of three major criteria, viz. sex, age, and intelligence. The effect of each of these on all the above correlations was evaluated by means of the analysis of variance technique. The classes were subdivided into three groups each, first in respect of age—119-150 months, 151-160 months, 161 months and above; second in respect of intelligence—standard scores of 21-25, 26-30, 31-41; and third in respect of sex—male, female, or mixed. For each of these subgroupings the mean correlations were tested for significant differences using analysis of variance. The Z transformation of all these coefficients before the variance analysis was not considered necessary in view of the mainly low correlations.

III.   RESULTS

(A)   The Factor Analysis.

The correlation matrix is given below. Above the diagonal are the zero order coefficients, below the diagonal the coefficients with age partialled out.

	Q	WTBD	WLDL	I	WA	A	Age	SCT	V	S	R	N	W
Q	( )	402	076	242	425	313	-151	038	-293	-212	-274	-211	-218
WT	380	( )	016	420	470	469	-261	007	-464	-264	-386	-288	-361
WL	071	007	( )	-208	111	-017	-036	097	-012	016	-002	-003	-018
I	225	401	-216	( )	449	306	-143	-119	-327	-211	-261	-223	-227
WA	406	437	106	432	( )	369	-227	100	-228	-187	-210	-219	-237
A	300	456	-022	294	353	( )	-124	-067	-166	-168	-159	-093	-136
Age	—	—	—	—	—	—	( )	-054	248	195	196	295	315
SCT	030	-007	095	-128	090	-074	—	( )	047	110	042	016	031
V	-267	-427	-003	-304	-182	-141	—	062	( )	383	607	455	631
S	-189	-225	009	-189	-149	-148	—	123	352	( )	477	363	286
R	-252	-354	003	-240	-173	-138	—	054	587	456	( )	508	518
N	-177	-229	008	-191	-163	-060	—	033	413	326	480	( )	433
W	-181	-304	-070	-192	-179	-103	—	050	601	241	490	375	( )

The centroid solution, after two iterations, with the estimated and computed communalities, follow:

	f_1	f_2	f_3	f_4	Σf^2	$h_o{}^2$	Diff.
Q	—470	—237	—236	192	370	406	036
WTBD	—643	—286	—226	—118	560	456	—104
WLDL	055	066	—387	192	194	216	022
I	—568	—315	277	—140	518	432	—086
WA	—476	—407	—212	184	471	437	—034
A	—446	—389	—065	—070	359	456	097
SCT	111	—076	—260	172	115	128	013
V	689	—331	174	193	652	601	—051
S	502	—228	—138	—218	371	456	085
R	668	—366	037	—101	592	587	—005
N	514	—298	—026	—167	382	480	098
W	569	—351	243	195	544	601	057
% age V^{ce}	26	9	5	3			

An extended vector rotation of the first three centroid factors gave the following simple structure on the reference vectors:

	RV_1	RV_2	RV_3
Q	—454	—152	027
WTBD	—545	—212	—051
WLDL	—005	—124	377
I	—448	—009	—424
WA	—601	—008	000
A	—541	025	—125
SCT	—078	050	282
V	026	699	111
S	—028	427	324
R	—044	677	235
N	—040	518	225
W	—025	664	000

The correlations between these reference vectors were:

	RV_1	RV_2	RV_3
RV_1	—	—387	—032
RV_2		—	—028
RV_3			—

RV_1 was identified as neuroticism, and RV_2 as intelligence. These correlated together —.387. Neuroticism and age correlated —270 and intelligence and age .318 over the whole group.

(B)   The Factor Measurement.

Using tests V, S, R, N, and W as a measure of the intelligence factor, a multiple regression analysis gave the correlation between the factor and the combined tests of .823. Using an equally weighted battery this correlation reduced to .810.

Similarly, with tests Q, WTBD, I, WA, and A as measures of the neuroticism factor, by use of regression weights the correlation was .752, while with equal weights the correlation worked out at .741.

In each case, therefore, as the differences between the weighted and the unweighted batteries are negligible, the unweighted battery was used in the factor measurement.

(C)   The Class Correlations.

The standard deviations of age within the classes averaged about four months. It was therefore unnecessary to correct the factor scores for age as long as the correlations were calculated within the school classes.

The within class correlations between sociometric status and neuroticism, intelligence, number of siblings, age, and position in family are as follows. The χ^2 analysis gives the significance of the trend indicated by the correlations.

CORRELATION BETWEEN SOCIOMETRIC STATUS AND:—

Class No.	Neuroti-cism	Intel-ligence	No. of Sibs.	Age	n. Pos. in Family
1	122	213	154	—291	157
2	—167	413	—300	049	039
3	—024	419	086	360	—065
4	—281	222	—247	—045	111
5	—227	346	139	—064	—169
6	—053	—223	—198	105	—065
7	—343	—098	337	125	—019
8	091	—129	—251	158	—382
9	003	158	124	213	—398
10	—211	—046	—023	109	—127
11	—297	157	—032	075	054
12	—408	198	—112	176	008
13	108	—007	—191	—057	—033
14	—041	107	115	189	—188
15	123	318	455	282	—123
16	440	—272	—132	001	—172
17	—331	462	069	084	—017
18	095	—012	—021	—419	—210
19	—766	147	—204	—126	—217
20	—300	—099	—087	416	019
21	—069	247	—098	207	—251
22	—132	075	—219	—001	—274
23	155	—351	—156	128	—278
24	—350	429	—062	076	—125
25	052	042	122	—090	—154
26	—007	149	013	446	—558
27	—296	535	—314	328	307
28	—012	006	—368	154	—113
29	—493	375	062	141	001
30	—280	143	—498	076	—103
31	—390	169	—213	—175	370
32	185	221	009	292	—654
33	063	275	—120	308	—021
34	—383	491	—002	—325	674
Total + ve	10	25	12	24	9
Total — ve	24	9	22	10	25
χ^2	5.75	7.56	2.94	5.75	7.56
p	$.02 > p > .01$	$p < .01$	$.1 > p > .05$	$.02 > p > .01$	$p < .01$

From this table it can be concluded that the correlation between socio-
metric status and:

neuroticism is significantly negative
intelligence is significantly positive
number of siblings is not significant
age is significantly positive
position in family is significantly negative (child of higher status is
younger member of family).

(D)   The Effects of Class Differences on the Correlations.

The effects of the three variables age, sex, and intelligence on the above
correlations were assessed by testing the significance of the difference between
the mean class correlations for each of the three subgroups named earlier.
The results of the analysis appear in the following tables.

From these tables it will be seen that out of the fifteen F ratios calcu-
lated only one can be considered significant, i.e., the sex of the class, its
relative age, and its relative intelligence have little bearing upon the correla-
tions calculated. The one exception—the significant relationship between
the sex of the class and the mean correlation between number of siblings
and sociometric status can perhaps best be explained at this stage of
research as a chance occurrence. The significance of one statistic in fifteen
is approaching the 5% chance expectancy.

IV.   Discussion

Perhaps the most striking feature of the results of the present study is
that they present almost exactly the same picture as the work of previous
investigators.

The work of Hsia (1928), Hardy (1937), Bonney (1944), and Damrin
(1949) shows that popular children come from smaller family units. That
of Hsia (1928) and of Young and Cooper (1944) indicates a positive rela-
tionship between popularity and age, though there is some evidence indicat-
ing no relationship (Loeb, 1941 and Frankel, 1947). That intelligence is
positively related to sociometric status is supported in papers by Hsia (1928),
Hardy (1937), Zillig (1933, 1934a, 1934b), Thomas and Young (1938),
Damrin (1949), and Bonney (1944). Frankel's (1947) work with pre-
school children does not support these findings, but as no figures are given,
it is difficult to assess its value.

Poor mental health has been pointed out again and again in the literature
as an important characteristic of the unpopular individual, the major works
being those of Hardy (1937), Northway (1944), Hill (1941), Young and

SUBDIVISIONS ON BASIS OF SEX. MEAN CORRELATIONS AND ANALYSIS OF VARIANCE.

Sex of Class	Male	Female	Mixed	Between Groups Variance (d.f. = 2)	Within Groups Variance (d.f. = 31)	F
No. of Classes	8	10	16			
Mean Λ family position						
sociometric status	−.145	−.155	−.100	.012	.055	.218 NS
no. of siblings	−.083	.063	−.131	.118	.033	3.573 (5%)
neuroticism	−.087	−.098	−.098	.051	.062	.823 NS
intelligence	.048	.248	.138	.091	.047	1.940 NS
age	.055	.088	.099	.037	.043	.860 NS

SUBDIVISIONS ON BASIS OF INTELLIGENCE. MEAN CORRELATIONS AND ANALYSIS OF VARIANCE.

Class Mean Intelligence	21 — 25	26 — 30	31 — 41	Between Groups Variance (d.f. = 2)	Within Groups Variance (d.f. = 31)	F
No. of Classes	13	13	8			
Mean Λ family position						
sociometric status	−.138	−.081	−.184	.028	.054	.519 NS
no. of siblings	−.014	−.145	−.008	.073	.036	2.016 NS
neuroticism	−.055	−.159	−.046	.048	.062	.774 NS
intelligence	.191	.160	.135	.014	.052	.269 NS
age	.112	.102	.014	.058	.042	1.381 NS

SUBDIVISIONS ON BASIS OF CLASS MEAN AGE. MEAN CORRELATIONS AND ANALYSIS OF VARIANCE.

Class Mean Age (months)	119 — 150	151 — 160	161 — 181	Between Groups Variance (d.f. = 2)	Within Groups Variance (d.f. = 31)	F
No. of Classes	12	12	10			
Mean Δ family position						
sociometric status	−.185	−.076	−.119	.036	.053	.679 NS
no. of siblings	−.138	−.018	−.027	.053	.037	1.432 NS
neuroticism	−.123	−.010	−.155	.065	.061	1.066 NS
intelligence	.129	.100	.233	.052	.050	.863 NS
age	.129	.025	.106	.067	.041	1.634 NS

Cooper (1944), Bonney (1947), Kuhlen and Bretsch (1947), Grossman and Wrighter (1948) and Baron (1951).

The similarities between the results of these investigators and the results of the present writer would appear to indicate that the effect of cultural differences on the correlates of popularity are almost negligible, though the comparative similarity between the cultures within the framework of which previous work has been carried out, and the culture drawn upon in the present study must be borne in mind.

An estimate of the over-all correlation found in this research between sociometric status and intelligence is .152 with a standard error of .034, while that between sociometric status and neuroticism is —.136 with the same standard error, i.e., both these relationships are slight, though statistically significant.

In almost every case, the relative age, intelligence, and sex of the group appears to be nowhere associated with the trend of the correlations calculated. That is, the relationship between the various factors considered, and popularity, is a comparatively stable one in groups differing in age, intelligence, and sex. The one exception to this general finding is that the mean correlations between number of siblings and sociometric status show significant differences when the sex of the group is considered. Further work is required, however, before this result can be taken at all seriously.

V. SUMMARY

(i) A sociometric test was administered to each of thirty-four school classes. Also administered were tests of intelligence and neuroticism, and further personal details were obtained.

(ii) Correlations were run within each class taken separately between sociometric status on the one hand, and intelligence, neuroticism, number of siblings, age, and position in family on the other. Intelligence and neuroticism scores were made possible by the factorial analysis of the data.

(iii) These correlations were on the whole small, and for no variable was the average correlation with sociometric status greater than .2.

(iv) The present results were in almost complete agreement with those of other workers, intelligence and age being positively correlated with sociometric status, the rest of the variables being negatively correlated.

(v) In general the relative age, sex, or intelligence of the classes did not affect the above correlations.

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ACQUAINTANCE SPAN AND SOCIOMETRIC STATUS

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Despite the voluminous literature on the use of the sociometric test, very little research has been devoted to the influence of acquaintanceship on sociometric results. In his original monograph, Moreno (2) showed the relationship between the volume of acquaintances of 16 persons and their emotional expansiveness, with an unlimited number of choices. However, there was no reference to the influence volume of acquaintances had on the sociometric status of these individuals. In a recent article, Borgatta (1) has inferred a relationship between these variables by stating, ". . . acquaintance itself may be considered as the non-criterion sociometric question on the lowest level of contact. . . ." He also pointed out the need for studies in this neglected area of sociometric research.

This study is an exploration of the relationship between acquaintance span and sociometric status. A review of the literature has revealed no studies directly pertinent to this problem

Method of Investigation

The data for this study were collected in four undergraduate educational psychology classes, seven weeks after the beginning of the spring semester. Since the class procedures consisted primarily of informal discussion, it was felt that this was a sufficient length of time for each student to develop his normal number of acquaintances. The acquaintances of each individual were determined by providing him with an alphabetical list of all the students in his class, and asking him to check the names of those students he did not know. Now knowing a student was defined as being unable to associate the name with the correct face. An analysis of these data yielded the following indices of acquaintance span in each of the four classes.

Social awareness—Per cent of students *known by* individual.

Social attraction—Per cent of students *knowing* individual.

Mutual acquaintances—Per cent of students individual knows *that also know him*.

Before the sociometric test was administered, each student introduced himself to his class members. During the introductions, the students were told to give special attention to the class members they did not know. This was done to give each student complete freedom in the sociometric choosing.

It was felt that the above procedure would enable the students to attach names to those class members whom they couldn't identify originally, but whom they might want to choose on the sociometric test. Consequently, a person's acquaintance span did not serve as a restriction on his range of choice.

The sociometric test, administered to each class, consisted of another alphabetical list of class members on which each student indicated the five classmates he *most preferred* as future teaching companions and the five classmates he *least preferred* as future teaching companions.

There were 104 students in the four college classes. All of them were seniors, nearing the completion of their work for a teaching certificate. Consequently, the above sociometric question seemed especially appropriate. All of the students approached the task seriously and made the requested number of positive and negative choices.

ANALYSIS OF DATA AND RESULTS

The results of the analysis of data on acquaintance span, in each of the four college classes, are reported in Table 1. It will be noted in this table that in all four groups the average social awareness score (per cent of

TABLE 1

ACQUAINTANCE SPAN OF STUDENTS IN EACH OF FOUR COLLEGE CLASSES, EXPRESSED IN PERCENTAGE OF STUDENTS IN CLASS

			Per Cent	
	Class	N	Md	Range
Social Awareness	A	21	52	24 to 81
	B	30	57	27 to 80
	C	27	59	29 to 89
	D	26	50	16 to 88
	mean		55	24 to 85
Social Attraction	A	21	43	19 to 86
	B	30	50	17 to 87
	C	27	52	26 to 89
	D	26	46	19 to 77
	mean		48	20 to 85
Mutual Acquaintances	A	21	38	10 to 76
	B	30	47	10 to 80
	C	27	49	18 to 81
	D	26	35	12 to 62
	mean		42	13 to 75

students known) is slightly over fifty per cent. However, there is a wide range in social awareness scores among the students in each of the four classes. There is likewise a wide range among students in social attraction scores (per cent of students knowing individual) and mutual acquaintances scores (per cent of students individual knows that also know him). This spread of scores for the three indices of acquaintance span is important, since their relationship to sociometric status can be more clearly determined.

The sociometric test was scored by giving +1 for each *positive choice* as teaching companion and —1 for each *negative choice*. Using this scoring procedure, a sociometric acceptance score, a sociometric rejection score, and a total sociometric status score were determined for each individual. This latter score was obtained by combining the positive and negative choices. In order to analyze the relationship of acquaintance span to sociometric status, it was decided to contrast and compare the acquaintance span of students on the extreme ends of the distribution of these three types of sociometric scores. Table 2 presents these results for the five most accepted and the five least accepted students in each class.

TABLE 2

ACQUAINTANCE SPAN OF FIVE MOST ACCEPTED STUDENTS AND FIVE LEAST ACCEPTED STU-
DENTS IN EACH OF FOUR COLLEGE CLASSES, USING FIVE POSITIVE
CHOICES WITH ONE SOCIOMETRIC CRITERION

| | N | Classes | | | | Mean |
		A	B	C	D	
		%	%	%	%	%
Social Awareness						
Most Accepted	20	54	57	61	57	57
Least Accepted	20	51	59	56	68	59
Social Attraction						
Most Accepted	20	66	48	69	47	58
Least Accepted	20	40	40	41	42	41
Mutual Acquaintances						
Most Accepted	20	44	41	50	40	44
Least Accepted	20	25	33	31	36	31

The social awareness scores for the most and least accepted students are almost identical. However, the most accepted students show a consistently higher social attraction score and mutual acquaintance score in all classes. Apparently those who receive the largest number of positive choices on a sociometric test are slightly better known than those who receive few or no

choices. This does not infer a direct relationship between being known in a group and being chosen on a sociometric test. Table 3 breaks down the social attraction data to reveal the per cent of students that knew and also chose the most and least accepted group members. It can readily be seen that a very small per cent of the students that knew the least accepted group also chose them. In contrast, almost two-thirds of the most accepted group received choices from students that knew them. It is significant to note that the number *choosing* the most accepted group members is, in all classes, smaller than the number *knowing* the least accepted group members. These differences between being known and being chosen reflect the minor role that acquaintance plays in obtaining positive choices on a sociometric test.

TABLE 3

PER CENT OF CLASS MEMBERS KNOWING AND CHOOSING FIVE MOST ACCEPTED STUDENTS AND FIVE LEAST ACCEPTED STUDENTS IN EACH OF FOUR COLLEGE CLASSES, USING FIVE POSITIVE CHOICES WITH ONE SOCIOMETRIC CRITERION

| | Classes | | | | |
	A	B	C	D	Mean
Most Accepted ($N = 20$)					
Number Knowing	69	72	93	62	74
Number Choosing	42	43	47	43	44
Per cent Knowing and Choosing	61	60	51	69	60
Least Accepted ($N = 20$)					
Number Knowing	48	59	56	55	55
Number Choosing	6	10	8	3	7
Per Cent Knowing and Choosing	13	17	14	6	13

The acquaintance span for the five most rejected and the five least rejected students in each class, reveals no consistent trend. It will be noted in Table 4 that, again, the social awareness scores are similar. It appears that both groups knew approximately the same number of class-members. Although the mean social attraction score is higher for the most rejected group, this direction is reversed in Class A. A similar reversal is found, in Class A, for the mutual acquaintance score. Thus, there appears to be no consistent difference in acquaintance span between the most rejected and the least rejected students. This can probably be accounted for by the fact that many of the least rejected group members fall into the most accepted category, on the positive scale, which raises their average acquaintance span.

The lack of relationship between being known and being rejected is brought out more clearly in Table 5. An average of seventy-five per cent of the students who knew the most rejected group members gave them rejection choices, while only seven per cent of those knowing the least rejected group members gave them such choices. As with the positive choices, it will be noted that the number *rejecting* the most rejected group members is, in all classes, smaller than the number *knowing* the least rejected group members. It seems that the number of rejection choices received, like the number of

TABLE 4

ACQUAINTANCE SPAN OF FIVE MOST REJECTED STUDENTS AND FIVE LEAST REJECTED STUDENTS IN EACH OF FOUR COLLEGE CLASSES, USING FIVE NEGATIVE CHOICES WITH ONE SOCIOMETRIC CRITERION

	N	Classes				Mean
		A	B	C	D	
Social Awareness		%	%	%	%	%
Most Rejected	20	55	67	59	55	59
Least Rejected	20	55	58	56	55	56
Social Attraction						
Most Rejected	20	40	65	61	51	54
Least Rejected	20	54	39	50	43	47
Mutual Acquaintances						
Most Rejected	20	24	54	47	34	40
Least Rejected	20	37	33	36	34	35

TABLE 5

PER CENT OF CLASS MEMBERS KNOWING AND REJECTING FIVE MOST REJECTED STUDENTS AND FIVE LEAST REJECTED STUDENTS IN EACH OF FOUR COLLEGE CLASSES, USING FIVE NEGATIVE CHOICES WITH ONE SOCIOMETRIC CRITERION

	Classes				Mean
	A	B	C	D	
Most Rejected (N = 20)					
Number Knowing	42	97	82	67	72
Number Rejecting	41	56	55	53	51
Per Cent Knowing and Rejecting	98	58	67	79	75
Least Rejected (N = 20)					
Number Knowing	57	59	68	57	60
Number Rejecting	7	2	3	4	4
Per Cent Knowing and Rejecting	12	3	4	7	7

acceptance choices received, is based mainly on the type of emotional reaction evoked from acquaintances, rather than the number of acquaintances a person has developed.

In comparing acquaintance span with total sociometric status, it was decided to include the five students with average sociometric status as well as those with highest and lowest status. These results are presented in Table 6. Here it will be seen that the social awareness scores are similar for all three status groups. In addition, the social attraction scores and mutual acquaintance scores are almost identical for the high and low status groups. Consequently, there is no difference in acquaintance span between the high and low status groups where positive and negative choices are used. Further examination of Table 6 will reveal that the average status group consistently

TABLE 6

ACQUAINTANCE SPAN OF FIVE STUDENTS WITH HIGHEST, AVERAGE, AND LOWEST SOCIO-
METRIC STATUS IN EACH OF FOUR COLLEGE CLASSES, USING FIVE POSITIVE AND
FIVE NEGATIVE CHOICES WITH ONE SOCIOMETRIC CRITERION

| | | Classes | | | | |
	N	A	B	C	D	Mean
Social Awareness		%	%	%	%	%
Highest Status	20	54	56	55	52	54
Average Status	20	48	57	53	45	51
Lowest Status	20	55	67	53	58	58
Social Attraction						
Highest Status	20	66	46	59	46	54
Average Status	20	43	42	42	32	40
Lowest Status	20	53	65	50	48	54
Mutual Acquaintances						
Highest Status	20	44	39	41	33	39
Average Status	20	27	34	32	26	30
Lowest Status	20	29	55	36	31	38

has the lowest social attraction and mutual acquaintance scores, in all classes. This is to be expected when positive and negative choices are combined, since persons with extreme acceptance or rejection move toward the ends of the distribution, while the least chosen group members shift toward the average status positions. Thus, the slightly lower average acquaintance span of those persons least accepted and rejected appears in the center of the distribution.

In light of the above general findings, it appears safe to conclude that

there is very little relationship, if any, between acquaintance span and sociometric status, where the group members have had ample opportunity to make acquaintances. This would not hold true, of course, where lack of acquaintances within a group would place actual restrictions on the range of choices given or received. The apparent lack of relationship between these variables can probably be accounted for by the various combinations of reactions that persons of similar acquaintance span might evoke. The socio-metric test releases either positive or negative emotional reactions toward selected persons. Consequently, a group member with a high acquaintance span may evoke primarily positive reactions from other individuals; he may evoke primarily negative reactions from other individuals; or he may evoke any one of numerous combinations of positive and negative reactions. Thus, although he has a high acquaintance span, he may have high, low, or average sociometric status. The same is true of the person with a low acquaintance span, except that his range on the scale may prevent him from attaining the extreme status positions. Even this restriction was not severe in this study, since the number *choosing* the most accepted and most rejected students was, in all classes, smaller than the number *knowing* the least accepted and least rejected students. Consequently, the small number of choices received by these latter group members was due primarily to the small fraction of acquaintances that chose them, rather than the number of acquaintances they had. Apparently, acquaintance span merely indicates the number of relationships a person has established with other group members, while sociometric status indicates the personal effectiveness of these relationships.

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JOB SATISFACTION AND INTERPERSONAL
DESIRABILITY VALUES

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BACKGROUND

Both management and labor have been keenly interested in and aware of the salient role that job satisfaction and employee morale play in the industrial climate. Measuring employee job satisfaction thus has received considerable attention within recent years, and morale or job attitudinal surveys have been eagerly employed by large and small industrial concerns alike. From these surveys and studies a plethora of interrelationships and interpretations about the various factors found, and of their effects, have been reported on in ascertaining employee satisfaction (3).

Out of this mass of facts, figures, and interpretations one can readily perceive the dynamic relationship of employee morale and job satisfaction to interpersonal relations. Both morale and job satisfaction have been defined in terms of the attitudes one holds towards the job, co-workers, confidence in management, and so on, so that in the end one's dealings with others influences his job satisfaction outlook (2). Thus, the effects of group identification and group acceptance help to determine one's status within the organization and thereby the extent to which satisfaction is derived from the job. Bellows (1), in this vein, points out that the manner and degree to which one is accepted by the group and adjusts to his fellow co-workers play a vital part in the employee's attitudes toward a host of job-related factors all of which go to make up for job satisfaction (or the lack of it).

A great deal of attention also has been drawn to the study of group interaction, leadership, and the relationship of these factors to morale and productivity. Sociometry (9) was developed as a new psychological technique and has been adapted to measure morale through a systematic analysis of group and subgroup formations and in this way determining to what extent group and subgroup formations affect the organization's structure and functions. Outstanding among these studies have been those of Lewin (7), Lippitt (8), and Jenkins (4), which have dealt with the climate of the work group under differing leadership approaches with respect to productivity of the work groups and morale level of work groups. Most of these studies, however, have not had their roots in, and application to, the industrial scene as such. Outside of a study by Van Zelst (13) little has been done or

reported on in the literature in an attempt to explore the relationship between interpersonal acceptance or desirability of workers and job satisfaction. This study was undertaken in order to explore the relationship between job satisfaction and worker interpersonal acceptance; specifically, to determine whether job satisfied and happy workers are also popular or desired workers.

SUBJECTS

The subjects in this study were the combined personnel from two small independently owned unorganized plants located in a small midwestern town. One plant manufactured lawn and porch furniture (N = 22) and the other handwoven machine belts (N = 14). In a previously reported study (10), using these same subjects, a correlation of —.76 was found between job satisfaction scores and the number of job related interview sessions that took place between the plant manager and workers over a one year period. This finding indicated that high employee morale is inversely related to the frequency of such job-related sessions.

PROCEDURE

In the present study the same personnel's job satisfaction scores were already available. Job satisfaction was determined by means of the *Kerr Tear Ballot for Industry, General Opinions* (6), a standardized and validated instrument utilizing the tear method of response which assures complete anonymity. The test itself consists of 10 items relating to job security, company welfare, supervisory ability, working conditions, interpersonal relationships, income, communications, confidence in the "intentions" of management, confidence in the "good sense" of management, and personal happiness. Each worker was also asked to write down the name of the worker he would "most like" to work with and the worker he would "least like" to work with if he had his choice. In both plants each of these work groups was small enough and every man knew every other man for a period of at least five years so that a wide sociometric choice was possible.

RESULTS AND DISCUSSION

The mean age of these male, manual, non-supervisory workers was 47.0 years, which is considerably higher than the mean age of other reported worker groups who have been tested on the Tear Ballot. The mean job satisfaction score for these combined groups was 44.6 which, also, is considerably higher than any other previously reported for any worker group (norm is

38.1). Each worker's sociometric standing was calculated by means of the empirical formula:

Likes — Dislikes = Interpersonal Desirability Value (12).

Some workers received as high as five "like" nominations, others received as low as three "dislike" nominations while many workers received neither "like" nor "dislike" nominations. The mean Interpersonal Desirability Values score for the combined groups was .66.

Intercorrelations between these variables—job satisfaction, age of worker, and interpersonal desirability values—were calculated. Significant correlations were found between one's job satisfaction score and one's age (.64) as well as between one's interpersonal desirability values score and one's age (.50), but no statistically significant correlation was found between one's job satisfaction score and one's interpersonal desirability value score (.31).

In a previously reported study (11) the author found that age and worker popularity correlated significantly which relationship was similarly borne out in this study, but this finding is at variance with the findings of Van Zelst (13), who found no relationship between age of worker and job satisfaction score. In his report Van Zelst stated that a lack of relationship between age and the other variables could be due to the fact that his group was "slightly higher than the norm for similar groups in job satisfaction and to be relatively homogeneous in regards to age," which, however, was also the case in the present study. It is interesting to note another point of variance between these studies, also. In the present study no significant relationship was found between one's job satisfaction score and his interpersonal desirability values score, yet Van Zelst found a significant correlation, albeit he stated that "the high correlation . . . may be somewhat overestimated. . . . This possibility is corroborated by the high intercorrelation of these variables with total job satisfaction score." However, in view of these contradictory results it would seem that a retest of the hypothesis would be in order using a larger sample and perhaps a more refined sociometric technique.

SUMMARY

A group of 36 workers from two small unorganized plants were administered a standardized job satisfaction questionnaire and were also asked to name the individual they would "most like" to work with and "least like" to work with, in order to derive a measure of interpersonal acceptance or popularity for each worker. This study was undertaken in order to determine the nature of the relationship between the interpersonal desirability of workers and their job satisfaction as measured by the *Kerr Tear Ballot for*

Industry, General Opinions. It was found that no significant relationship exists between worker popularity and job satisfaction, but that age is significantly related both to job satisfaction and to interpersonal acceptance.

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THE CONCENTRATION OF LIKED AND DISLIKED MEMBERS IN GROUPS AND THE RELATIONSHIP OF THE CONCENTRATIONS TO GROUP COHESIVENESS

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The following study is an effort to isolate new and stable measures of group structure and to relate these measures to group cohesiveness. The measures flow from the following simple rationale. Every group has a number of popular and unpopular members who fulfill some function in the group. While efforts have been made to determine the dominant characteristics of such persons, to date no effort has been made to investigate the group traits of liking and disliking its members. However, it would be of considerable interest to know whether groups differ in their attitudes toward their popular and unpopular members, and, if so, how such traits are related to group cohesiveness.

The subject of the following study is the derivation of measures of the group concentration of liked and disliked members, the distribution of these measures, the relationship between them, and the relationship of these measures to group cohesiveness.

EXPERIMENTAL PROCEDURE

Subjects

Forty-two classes of high school students in four high schools in the District of Columbia were used as subjects.

Data Collected

The students in each class were given a printed sheet, which contained a brief explanation of the study and directions. Their first task was to rate the class as a group. To do this the students were presented with ten randomized statements about the cohesiveness of the class and were asked to pick out the one statement which best reflected how they felt about the class as a group. The rank-order of these statements had previously been established by Kendall and Kendall's method (4). This method is based on the fact that if there is little agreement among the raters as to the relative

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position of the statements, the sum of the rankings of each statement will be more or less equal. In so far as there is agreement among the raters, the average rankings will represent the relative positions of the statements and the variance of these average rankings will increase. Kendall derived a coefficient of concordance (W) and a distribution to test the significance of the coefficient of concordance.

To establish the rank, or scale positions, of our statements, we asked eighteen observers to rate the statements. Position one was to be given to that statement which described the most favorable impression of the class; position ten, the least favorable. Our W-score was +0.85, which was significant at .001 level.

The statements were then presented in random fashion to the classes. The frequency with which each statement was checked was tabulated for each class, and the over-all frequency was totaled to give the distribution of the entire sample. From the sample distribution, normalized T-scores were computed for each statement.

However, the class score gives no information as to the agreement among the members concerning the rating of the class. Two classes with the same average could have quite different distributions of their ratings. In order to get some measure of the distribution of class ratings, we computed a standard deviation for each class. A low sigma represents strong agreement; a high sigma, weak agreement. This score has been called Class Agreement (Sigma) Index.

Each student was asked to list on the last part of the task sheet the five persons in the class he liked the most and the five persons he liked the least. We chose to have the students list the persons they liked the least rather than those they disliked in order to minimize any natural resistance to speak of disliked persons. We assumed that both tests produced essentially the same results.

The problem of how to quantify the concentration of like votes and dislike votes was solved on the basis of the method used by Katz and Braly in their study of racial prejudice (3). These investigators measured "relative clearness and consistency of pattern of stereotypes" by the number of traits needed to define a race. Our method is a copy of theirs. The most popular members received the most votes, just as the generally recognized stereotype traits were used more frequently in Katz and Braly's study. We then found the least number of persons in the class who accounted for 50 per cent of the possible votes (five times size of class). To find the relative concentration of this number, we divided it by the class size.

Two arbitrary decisions are involved in this procedure: the use of the 50 per cent cutoff and the division of the resulting figure by the class size. In order to get some idea of the relation of the 50 per cent cutoff mark to another possible cutoff, scores were computed using a 25 per cent level for 19 classes. The rank-order correlation between the two cutoff levels was .69. This indicated that the two were sufficiently related, and for our purposes each level would produce substantially the same results.

We divided our concentration score by class size in the hope of insuring that the scores were comparable between groups of varying size. But we could find no absolute rationale for this, nor could we yet be sure that our scores were comparable. Thus it was decided to use both scores as indices.

The same procedure, of course, was used in computing both like and dislike indices. As a result, we derived two like measures—Like Measure (Ratio) and Like Measure (Absolute)—and two corresponding dislike measures.

Independently, a seven-point rating scale was given to all the teachers who regularly teach the class. On the scale they were asked to rate the class according to its cohesiveness. A nominal definition of cohesiveness was supplied: "Cohesiveness is the quality of a group whereby it works toward common goals, thinks in terms of 'we' instead of 'I,' manifests friendliness toward members of the group, generally sticks together, and functions as a unit rather than as a collection of individuals." The data were normalized and each class given a T-score according to the procedure described above.

For calculating the average age of each class, we took advantage of the fact that the classes were homogeneous in age and that each academic year represented a different age group. We assumed the average age of the freshmen classes to be 14; the sophomore, 15; the junior, 16; and the senior, 17.

RESULTS AND DISCUSSION[3]

The means and standard deviations of our variables are given in Table 1. The distributions of the like and dislike measures are given in Tables 2 and 3, and are shown in Figures 1 and 2. As we were interested in the characteristics of the distribution of the like and dislike indices, we tested for normality. For the Like (Absolute) Index and the Dislike (Absolute) Index,

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[3]For additional statistical materials and further discussion, the reader is referred to the writer's master's thesis, "Group Cohesiveness and Its Relation to In-Group Dislikes," May, 1953, on file in the Mullen Library, The Catholic University of America, Washington, D. C.

χ^2 tests show that the deviations from the normal do not exceed chance. For the Like (Absolute) Index with a χ^2 of 10.09 for 9 df, p of normality is between .50 and .30. For the Dislike (Absolute) Index with a χ^2 of 3.74 for 8 df, p of normality is between .80 and .90.

The means of our dislike measures in both ratio and absolute form are lower than the corresponding like indices. The significance was tested, and
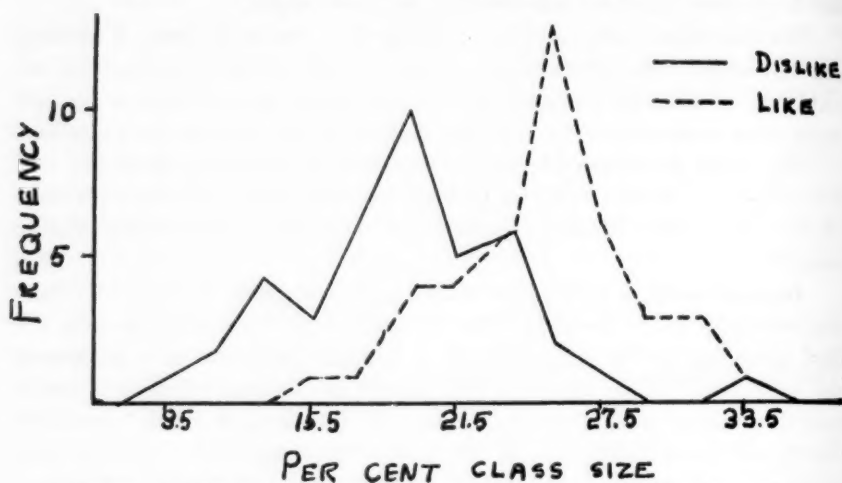

FIGURE 1. Distribution of ratio scores of the like and dislike measures.
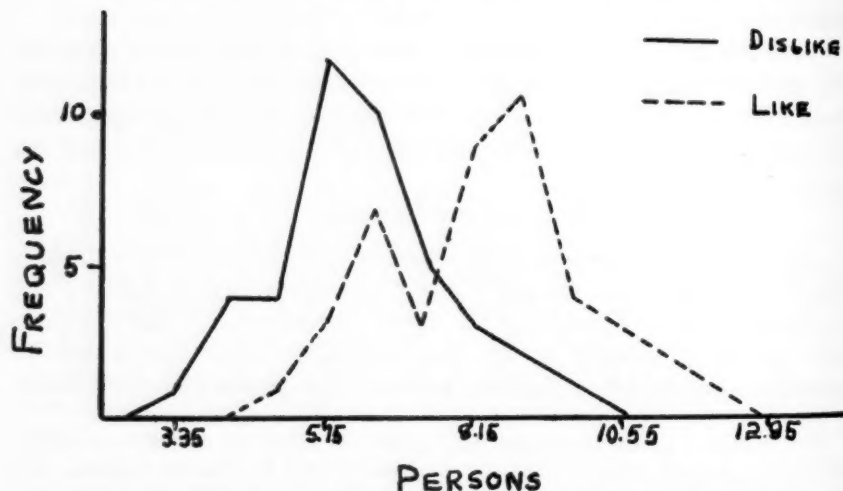
FIGURE 2. Distribution of absolute scores of the like and dislike measures.

both differences had a chance probability of less than .0001. Brieland (1) reported what seem to be comparable results. In a study of the adjustment of children he found that there was much more agreement among the children themselves on who showed undesirable behavior than on who showed desirable behavior. Our results, supported by Brieland's, seem to point to a stable, underlying characteristic of group behavior.

Our Class Agreement (Sigma) Index is also a concentration measure. Tested for normality, the scores yielded a χ^2 of 26.24, which for 12 df has a p of normality less than .01. On the basis of this we would have to reject the hypothesis of normality for the distribution of this measure.

TABLE 1
MEAN AND STANDARD DEVIATIONS

Measures	Mean	Standard deviation
1. Class size	33.3	4.4
2. Class rating index	49.1	2.7
3. Teacher rating index	49.9	8.3
4. Age	15.4	1.0
5. Like measure (ratio)	25.0	3.9
6. Dislike measure (ratio)	19.2	4.6
7. Like measure (absolute)	8.3	1.6
8. Dislike measure (absolute)	6.2	1.4
9. Class agreement (sigma)	10.7	4.1

TABLE 2
DISTRIBUTION OF RATIO SCORES OF THE LIKE AND DISLIKE MEASURES

Per cent class size	Like	Dislike
8.5—10.4		1
10.5—12.4		2
12.5—14.4		4
14.5—16.4	1	3
16.5—18.4	1	7
18.5—20.4	4	10
20.5—22.4	4	5
22.5—24.4	6	6
24.5—26.4	13	2
26.5—28.4	6	1
28.5—30.4	3	
30.5—32.4	3	
32.5—34.4	1	1

TABLE 3
DISTRIBUTION OF ABSOLUTE SCORES OF THE LIKE AND DISLIKE MEASURES

Persons	Like	Dislike
2.95— 3.74		1
3.75— 4.54		4
4.55— 5.34	1	4
5.35— 6.14	3	12
6.15— 6.94	7	10
6.95— 7.74	3	5
7.75— 8.54	9	3
8.55— 9.34	11	2
9.35—10.14	4	1
10.14—10.94	1	
10.95—11.74	2	
11.75—12.54	1	

The nine variables were intercorrelated (Pearson r). The correlations involving the like indices, dislike indices, and the Class Agreement (Sigma) Index were reflected. This was done because of the inverse method of measuring concentration. High concentration was typified by low numerical scores. The correlations with reflections are given in the upper part of Table 4. This matrix was factored according to Thurstone's centroid method, but a simple factor solution was not found.

As we were not sure of the effect of group size on our correlation, we partialed out this variable from all correlations. The resulting matrix is given in the lower part of Table 4. It is to be noted that the partialing procedure did not drastically change any of the correlations. We conclude that our measures were unaffected by the variation in class size of our sample. Consequently, in our interpretation of the correlations, we shall refer only to the unpartialed correlations.

The most interesting correlations are between the like and dislike indices. In both absolute and ratio forms, the correlations are positive and significant. A related correlation between in-group choices of friends and in-group dislike choices was noted by Martin, Darley, and Gross (5). They found that groups that tended to make many in-group choices of friends also made many in-group dislike choices. The findings of these investigators plus our own results could be interpreted as a manifestation of the presence of structure in the form of status hierarchy in groups. Groups that more readily and clearly recognize their popular and unpopular members thereby

TABLE 4
MATRIX OF CORRELATIONS (x 100)

(Upper section contains intercorrelations; lower section contains intercorrelations with class and size held constant.)

Measures	2	3	4	5	6	7	8	9
1. Class size	26	22	—08	10	11	—62**	—37*	—30
2. Class rating		41**	—07	—02	—06	—61**	—31	25
3. Teacher rating	35*		12	—13	—10	—29	—18	07
4. Age	—05	12		—12	00	—10	—02	06
5†. Like (ratio)	—05	—15	—13		41**	72**	38	17
6†. Dislike (ratio)	—09	—12	—01	41**		22	80**	—02
7†. Like (absolute)	—59**	—19	—19	100**	37*		47**	35*
8†. Dislike (absolute)	—24	—11	—05	35*	91**	33*		19
9†. Class agreement (sigma)	36*	15	04	21	01	21	01	

*Significant at the .05 level.
**Significant at the .01 level.
†Reflected.

exhibit the status hierarchy of the group: these are the popular (desirable) members; those are the unpopular (undesirable) members.

The results could also be a reflection of a general attitudinal structure in the group: groups tend to agree as to how they feel about matters that are of importance to the group. If this is so, we should expect to find a correlation between the Class Agreement (Sigma) Index and the like and dislike indices. Inspection of our table shows that this index does correlate significantly with the Like (Absolute) Index. This correlation is only at the .05 level and is not supported by correlations with the other like and dislike indices. We have, then, no basis for interpreting the correlation between our like and dislike indices as a manifestation of a comprehensive attitudinal structure.

All correlations between the like and dislike indices and the two cohesiveness indices, Class Rating and Teacher Rating, are negative. Only one of these correlations, that between Class Rating and Like (Absolute) Index, is significant at an acceptable level. Because of the lack of a number of significant correlations, interpretation is precarious; but it seems reasonable to state that if any relationship exists between cohesiveness and the like and dislike concentrations in groups, it is negative. In other words, the more clearly a group recognizes and designates its popular and unpopular members, the less the group seems to function as a unit, has a stick-together quality, and or manifests friendliness toward its members. It seems that the hypothesized status hierarchy is related to group dissatisfaction. Perhaps it reflects a reaction to tension in the group.

SUMMARY

Forty-two classes of high school students rated their own class as to its cohesiveness and named the five persons in the class they liked the most and the five persons they liked the least (disliked). Independently, the teachers of the classes rated each class as to its cohesiveness.

1. The sample distributions of the measure of concentration of liked persons and measure of concentration of disliked persons do not vary significantly from those which would be expected if the population distributions were normal.

2. The concentration of disliked persons in groups was significantly greater than the concentration of liked persons; that is, group members agreed more readily as to the members they liked the least than as to the members they liked the most.

3. The measure of concentration of liked persons and the measure of

concentration of disliked persons were positively and significantly correlated; that is, groups that readily agreed as to who the liked members were tended to agree as to who the disliked members were.

4. Two independent measures of cohesiveness, one based on member rating, the other based on nonmember rating, were positively and significantly correlated.

5. Both cohesiveness measures correlated negatively with like and dislike concentration measures; that is, groups that showed more agreement as to who were the liked and disliked members generally were rated less cohesive by the members and by nonmembers who knew the groups.

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LEADER BEHAVIOR OF B-29 COMMANDERS AND CHANGES IN CREW MEMBERS' ATTITUDES TOWARD THE CREW[1]

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The development of an effective air crew involves more than simply putting together a group of specialists. In addition to the obvious requirement that all crew members be technically proficient, there also is a need within the crew for attitudes conducive to effective performance. The leadership responsibilities assigned to the aircraft commander would seem to give him greater potential than any other crew member for influencing crew attitudes. The present study deals with the relationship between two dimensions of the aircraft commander's leader behavior and changes in crew members' attitudes toward their crew and their fellow crew members during the initial period of crew assembly.

PROCEDURE

The members of 52 newly assembled B-29 crews described the leader behavior of their respective commanders on a *Leader Behavior Description Questionnaire*; and rated each other, and the crews as units on such items as crew morale, friendship, proficiency, and willingness to go to combat with each other. The Leader Behavior Description Questionnaire, administered at the end of training, provides scores on two empirically derived dimensions: Consideration, and Initiating Structure (1). The 28 items on the Consideration key describe specific leader behaviors indicative of friendship, mutual trust, respect, and warmth in the relationship between the aircraft commander and the members of his crew. Three illustrative items from this key are:

1. He puts suggestions by the crew into operation.
2. He is friendly and approachable.
3. He gives credit when credit is due.

Initiating Structure is represented by 29 items, which refer to the air-

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craft commander's behavior in organizing and defining roles; and in establishing clear-cut patterns of organization and channels of communication for getting jobs done. Three of the items from the Initiating Structure key are:

1. He encourages the use of uniform procedures.
2. He maintains definite standards of performance.
3. He lets crew members know what is expected of them.

For each item on the Leader Behavior Description Questionnaire, the crew members, other than the aircraft commander, himself, indicated the frequency with which the commander engaged in the described behavior by checking one of five adverbs: always, often, occasionally, seldom or never. Each item was scored on a scale from 0 to 4. These leader behavior description scores were averaged by crew on each dimension separately, to determine the Commanders' Consideration and Initiating Structure scores.[2]

Crew attitudes were elicited by a series of 10 items on which the crew members rated each other individually, and collectively as a crew. In order to obtain a measure of change in attitudes, these items were administered both at the beginning and end of the training period. An average period of 10 days intervened between the two administrations. Attitudes toward the crew as a unit were obtained on 3 items: (1) crew morale, (2) crew cooperation, and (3) attitude toward remaining with the present crew. Attitudes toward individual crew members were measured by the following seven peer rating items.

1. How would you rate each member of your crew as your friend or possible friend?
2. If war came with a major power tomorrow, how willing would you be to go to combat with each member of your crew?
3. Disregarding M.O.S.,[3] how proficient do you think each member of your crew is?
4. Rate the morale of each man in this crew.
5. How much confidence do you have in each member of your crew?
6. Rate the amount of time you spend in talking to each of the other crew members in connection with the performance of duties.
7. Rate the amount of time you spend in conversation with each crew member other than that necessary for the performance of duties.

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[2]This procedure is justified by a previously reported (1) comparison of between-crew and within-crew variances, for each dimension separately. The F ratios were significant at the .01 level in both cases.

[3]Military Occupational Speciality.

The response to each item was made on a graphic rating scale containing nine points anchored by five verbal descriptions. For each item, the average rating given by the members of the crew was computed for each crew. Difference scores which indicate the magnitude and direction of change in attitude were obtained by subtracting the crew average on the first administration from the average on the second administration of each item. In order to obviate spurious correlations, all ratings given or received by the aircraft commander himself were excluded. The statistical significance of differences in attitude before and after training was determined by the t test.

Correlations were computed between the Consideration and Initiating Structure scores assigned by the crew members to their respective aircraft commanders and the change scores on the attitude items.

RESULTS

The analysis of attitude changes indicates that ratings of crew morale and of willingness to remain with the crew decrease significantly during training (see Table 1).

TABLE 1

MEANS, STANDARD DEVIATIONS, AND t RATIOS BY TOTAL CREW FOR DIFFERENCES IN *Attitude Toward Crew*† BETWEEN FIRST AND SECOND TEST ADMINISTRATIONS
(N = 52)

Attitude Questions	First Administration		Second Administration		
	Mean	σ	Mean	σ	t‡
1. Morale	7.30	.87	6.96	.89	3.06**
2. Cooperation	7.01	.88	7.01	.85	.00
3. Remain with Present Crew	7.72	.83	7.48	.84	2.40*

*Significant at the .05 level of confidence.
**Significant at the .01 level of confidence.
†All ratings on 9 point scales.
‡Italics indicate negative change.

Ratings assigned to individual crew members (Table 2) are significantly higher after crew training on all but two questions: (1) willingness to go to combat with individual crew members, and (2) individual morale.

A comparison of the direction of the changes in crew averages indicates that attitudes toward crews and attitudes toward individuals are differentiated. At the outset of training, the attitudes toward crews are more favorable than those toward individuals, whereas little difference exists at the

end of training. For example, ratings of crew morale at the beginning of training average 7.30 and ratings of individual morale average 6.89. This difference is significant at the 1 per cent level of confidence (t = 5.13). However, the post-training mean ratings of 6.96 for crew morale and 6.95 for individual morale do not differ significantly (t = 0.67).

TABLE 2

MEANS, STANDARD DEVIATIONS, AND t RATIOS BY TOTAL CREW FOR DIFFERENCES IN
Attitude Toward Individual Crew Members† BETWEEN FIRST AND SECOND
TEST ADMINISTRATIONS (N = 52)

Attitude Questions	First Administration		Second Administration		
	Mean	σ	Mean	σ	t
4. Friendship	6.28	.38	6.55	.49	4.85**
5. Willing to Go to Combat	6.51	.62	6.67	.80	1.95
6. Proficiency	6.98	.56	7.20	.54	3.38**
7. Morale	6.89	.71	6.95	.78	.56
8. Confidence	6.58	.55	6.93	.63	6.19**
9. Talk on Duty	5.97	.53	6.15	.65	2.19*
10. Talk off Duty	5.42	.65	5.74	.65	3.67**

*Significant at the .05 level of confidence.
**Significant at the .01 level of confidence.
†All ratings on 9 point scales.

It is plausible to hypothesize that individual crew members had high expectancies for their crews in what might be conceived as *esprit de corps*. As an expression of their desire to have an outstanding crew, members rate their crews relatively high on such items as morale, cooperation, and their own attitude toward remaining with the crew. Their ratings of fellow crew members as individuals are slightly lower, reflecting cautiousness in rating men with whom they have had only a short acquaintance. Although they expressed a relatively high regard for each other, they probably do not know each other well enough to do more than indicate a generally favorable attitude to one another. At the end of the training period, the crew has proved to fall a little short of what was hoped for, but is still regarded as a "good crew" by its members. A new appraisal of most of the individual members results, on the other hand, in more whole-hearted endorsement of their desirability as crew members.

The correlations between the Leader Behavior Description Questionnaire scores and changes in attitudes indicate (Table 3) that crews whose com-

manders are described as high on Consideration increase their ratings of each other on four of the attitude items. There was an increase in the amount of conversation pertaining to duty, mutual confidence, and in willingness to go to combat. Crews whose commanders are described as high on Initiating Structure tended to increase their ratings of each other on friendship and confidence.

TABLE 3

CORRELATIONS BETWEEN CONSIDERATION AND INITIATING STRUCTURE SCORES AND *Changes* IN ATTITUDE TOWARD THE CREW AND CREW MEMBERS (N = 52)

	Changes in Attitude	Consideration	Structure
Attitudes	Morale	.06	.05
Toward	Cooperation	.14	.01
Crew	Remain with Crew	.18	.13
	Friendship	.32*	.28*
Attitudes	Combat	.40**	.20
Toward	Proficiency	.12	.02
Crew	Morale	.26	.17
Members	Confidence	.43**	.32*
	Talk on Duty	.46**	.21
	Talk off Duty	.17	—.05

*Significant at the .05 level of confidence.
**Significant at the .01 level of confidence.
†Aircraft commanders' attitude scores omitted.

In interpreting these findings, it is important to note a limiting condition of this study—that, the demands of the training situation did not permit the use either of a control group or of variation in the time interval over which attitude changes were studied. Accordingly, the changes in attitude cannot be attributed to the effect of any specific part of the training which the crews received during the ten days. There even may be a question whether the training, *per se,* has any influence upon attitude changes.

The findings imply, however, that during the initial period of crew assembly, the members of crews whose commanders score high on both Consideration and Initiating Structure tend to develop more favorable crew attitudes than the members of crews led by commanders who are described as less Considerate and less inclined to Initiate Structure.

SUMMARY

This paper reports the relationship observed between changes in crew members' attitudes and the crew members' perception of their commander's

leadership behavior. It appears that the development of desirable attitudes among the members of a newly formed crew is, in part, a function of crew leadership. Perceived Consideration on the part of the crews' leaders is associated with more rapid development of mutual confidence and willingness to go into combat. Initiation of Structure behavior is also related to a more rapid development of friendship and confidence. These findings indicate the influence of leadership style upon early group-learning experience.

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FIRST NOTE ON THE SOCIOMETRIC SYSTEM

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There is a notable discrepancy between the sociometric system as out-
lined in the first edition of *Who Shall Survive?* (1934) and the second,
revised edition (1953). In the first edition sociometry is described as a sub-
system of socionomy, "That part of socionomy which deals with the mathe-
matical study of psychological properties of populations, the experimental
technique of and the results obtained by application of quantitative methods
is called *sociometry*." (p. 10) In the second edition sociometry is so defined
(p. 48-59) that it appears as the all-encompassing system. It appears as if
I have reversed my position as to the relationship between socionomy and
sociometry. This is a misunderstanding and may require some explanation.

The sociometric system is not an all-encompassing system of social rela-
tions, but itself a sub-system within a larger framework. But I have never
spelled this out properly and presented a complete scheme. The over-all top
of the system is socionomy; it has three branches, sociodynamics, sociometry
and sociatry. Socionomy is the science of social laws (or whatever modern
equivalent one would give to "law"). Sociodynamics is a science of the struc-
ture of social aggregates, of single groups and of group clusters (it overlaps
in part with the area which is often labelled group dynamics). Sociometry
is the science of socius measurement, an architectonically structured system
of social measurements with sociometric tests at its base (which cannot be
bypassed); it is not quantitative sociology but the socius quantified, the
emphasis is upon socius first, metrum second. And last in line is sociatry,
the science of social healing. However, one depends upon the other. In a
practical frame of reference the sequence of order is reversed, the processes
of social healing come first and the science of social laws comes last. In
contrast with the current custom to call all techniques sociometric techniques,
from sociometric tests to roleplaying and sociodrama, this would designate
their distribution into a number of categories, sociodynamic, sociometric and
sociatric techniques.

The reason why sociometry, although theoretically speaking a sub-system,
has been continuously put into the center of presentation and has received
the major part of the attention in the course of years, can be explained
historically by the conditions in which the social sciences were when sociom-
etry emerged. In the first twenty-five years of the twentieth century all

SOCIONOMY
(Science of Social "Laws")

Sociodynamics
(Science of Dynamics
of Groups and
Inter-Groups)

Sociometry
(Science of Socius
Measurement)

Sociatry
(Science of Social
Healing)
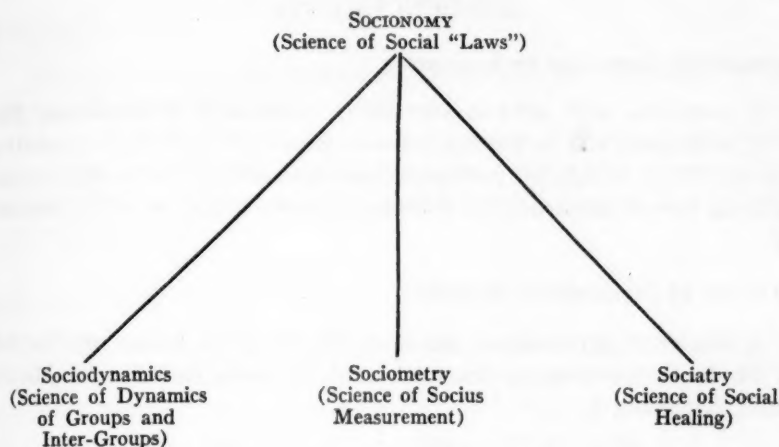
social measurement was of a demographic character, it was demometry. It was then of importance to develop sociometric instruments and to demonstrate the possibility that besides the vital statistics of demometry a direct study of the actual structure of groups can be made and measured. The link between the socius and the metrum had then a revolutionary character. It seemed didactic and opportune to focus the attention upon sociometry as a core. This was not only due to my own, but to the great interest which the instrumentalities of sociometry aroused whereas its theoretical implications were overlooked.

ANNOUNCEMENTS

International Committee on Sociometry

A committee with units in over thirty countries is in formation. The list of participants will be given in the next issue. The aim of the committee is to establish a vehicle for permanent communication of sociometric activities in the various countries. For information, write to P.O. Box 311, Beacon, N.Y.

A Theatre of Psychodrama in India

A theatre of psychodrama has been created by an Indian psychiatrist, Dr. M. V. Govindaswamy, director of the All-India Institute for Mental Health, Bangalore 2.

Psychodrama and Group Psychotherapy in Wormwood Scrubs Prison, London, England

Dr. John J. Landers, Principal Medical Officer of Wormwood Scrubs Prison is combining psychodrama and group psychotherapy in the treatment of delinquents with personality disorders.

Foreign Exchange Students to Moreno Institute

The Moreno Institute has enabled two foreign psychiatrists, Dr. Marcel Raclot, from the Hospital St. Anne, Paris, France, under the direction of Dr. Jean Delay, and Dr. Luigi Meschieri, of the University of Rome, to come to this country under the auspices of the Fulbright Act. In addition, other foreign students have enrolled at the Moreno Institute during 1954 and 1955, Dr. Pedro Leon, Assistant to Dr. Carlo Seguin, at the Department of Psychiatry, San Marcos University, Lima, Peru; Helga Straub, psychologist at the University Clinic of Tübingen, Germany, Director Dr. E. Kretschmer and Nano de Rham, Assistant Director of "Le Bercail," a home for disturbed children, under the direction of Dr. Bergier, at Lausanne, Switzerland. These students have been given full or part scholarships in group psychotherapy, psychodrama and sociometry.

Leopold von Wiese Retires

The founder of the *Kölner Zeitschrift für Soziologie* retired from its editorship at the end of 1954. The Westdeutscher Verlag Opladen, Germany, will continue its publication under a new editorial committee.

New Books Received

Georges Gurvitch, "Determinismes Sociaux et Liberty Humaine," Presses Universitaires de France, Paris, 1955, p. 301.

I. Johannesson, "Studier av Sociala Relationer Mellan Barn i Folkskole-klasser" (In Swedish, with an English summary, "Studies in Social Relations Between Children in Elementary School Classes"), Gleerup, Lund Sweden, 1954, p. 341.

Easter Workshop, Moreno Institute

The next workshop on training in psychodrama and group psychotherapy takes place April 8, 9, and 10 at the Moreno Institute, Beacon, New York. A large number of specialists will gather, including students from France, Dr. Marcel Raclot; from Switzerland, Miss Nanon de Rham; from Peru, Dr. Pedro Leon; James Enneis from Washington, D. C., President Elect of the American Society of Group Psychotherapy and Psychodrama, who brings along a group of workers on the administrative level in government. Fee for tuition, room and board is $60.00 for the three days.